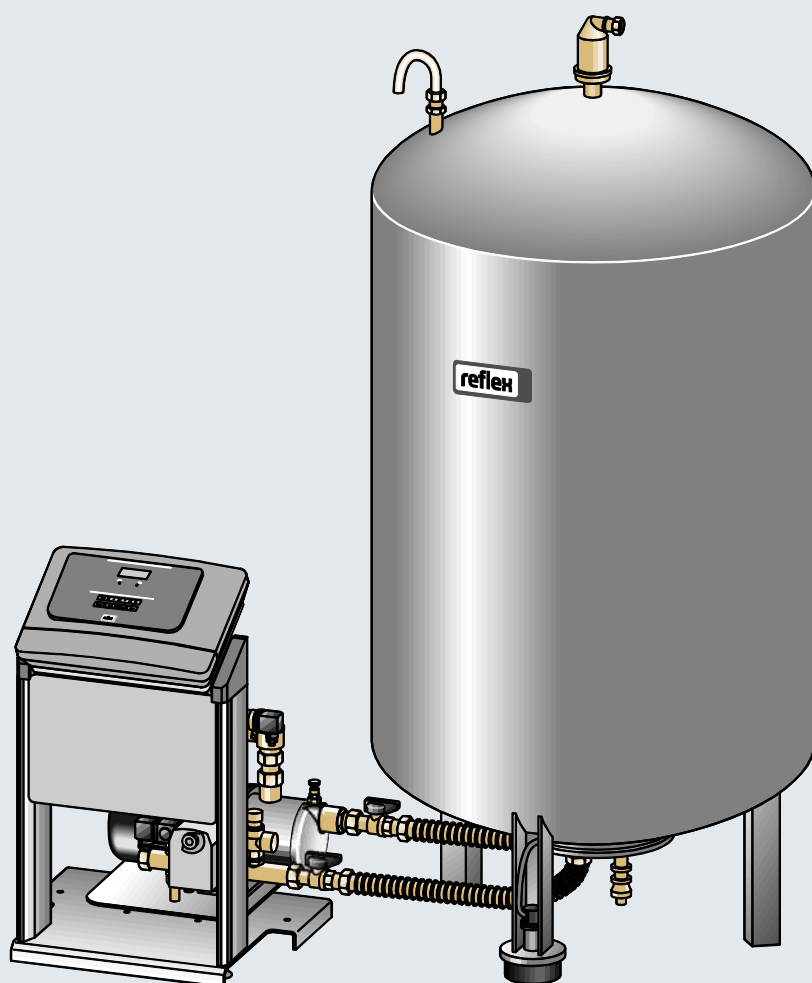


Variomat 1

GB **Operating manual**
Original operating manual



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1 Notes on the operating manual

This operating manual is an important aid for the safe and reliable function of the device.

The operating manual is intended to:

- Avert dangers to personnel.
- Understand the device.
- Obtain optimal functioning.
- Early identify and rectify problems.
- Avoid faults caused by improper use.
- Prevent repair costs and downtimes.
- Increase reliability and service life.
- Prevent damage to the environment.

Reflex Winkelmann GmbH cannot accept any liability for damage caused by ignoring this operating manual. In addition to this operating manual, you must comply with national legislation and regulations in the country of use (accident prevention, environment protection, save and proper work, etc.).

This operating manual describes the device with basic equipment for degassing and interfaces for optional equipment with additional functions. For optional equipment and accessories, see chapter 4.6 "Optional equipment and accessories" on page 13 .



Notice!

Every person installing this equipment or performing any other work at the equipment is required to carefully read this operating manual prior to commencing work and to comply with its instructions. The manual is to be provided to the product operator and must be stored near the product for access at any time.

2 Liability and guarantee

The product is manufactured to the latest engineering standards and acknowledged safety regulations. Nevertheless, risk of injury and death for the user and other parties and damage to the system and other property can arise from its use.

Modifications of the device such as changes of the hydraulic system or interference with the interconnection are strictly prohibited.

The liability and guarantee of the manufacturer are excluded when the malfunction can be traced back to one or more of the following causes:

- Improper use of the device.
- Improper commissioning, operation, maintenance, servicing, repair, and installation of the device.
- Ignoring the safety notes in this operating manual.
- Device operation with defective or improperly installed safety and/or protective equipment.
- Failure to perform maintenance and inspection work at due times.
- Use of unauthorised replacement parts and accessories.

The precondition for any guarantee claims is the proper installation and commissioning of the device.



Notice!

Have the Reflex Customer Service carry out commissioning and the annual maintenance, see chapter 11.1 "Reflex Customer Service" on page 64 .

3 Safety

3.1 Explanation of symbols

3.1.1 Symbols and notes used

The following symbols are used in this operating manual.



Danger

- Danger to life and/or severe damage to health
 - The corresponding warning symbol in combination with the "Danger" signal term indicates an imminent threatening danger which will result in death or severe (irreversible) injuries.



Warning

- Severe damage to health
 - The corresponding warning symbol in combination with the "Warning" signal term indicates a threatening danger which may result in death or severe (irreversible) injuries.



Caution

- Damage to health
 - The corresponding warning symbol in combination with the "Caution" signal term indicates a danger which may result in minor (reversible) injuries.



Attention!

- Damage to property
 - This symbol in combination with the "Attention" signal word indicates a situation that may cause damage to the product itself or objects in its vicinity.



Notice!

This symbol in combination with the "Notice" signal word indicates useful tips and recommendations regarding the efficient use of the product.

3.1.2 Safety symbols used

The following safety symbols are used in this operating manual. They are also attached to the equipment or in its vicinity.



This symbol warns of electric voltage.



This symbol warns of a hot surface.



This symbol warns of overpressure in conduits and connections.

3.2 Personnel requirements

Only specialist personnel or specifically trained personnel may install and operate the equipment.

The electric connections and the wiring of the device must be executed by a specialist in accordance with all applicable national and local regulations.

3.3 Personal protective equipment

When working at the system, wear the stipulated personal equipment such as hearing and eye protection, safety boots, helmet, protective clothing, protective gloves.



See the national regulation of your country for personal protective equipment required.

3.4 Intended use

- The devices are manufactured from steel with exterior coating; the interior is uncoated. The devices may be used only in systems that are sealed against corrosion and with the following water types:
 - Non-corrosive
 - Chemically non-aggressive
 - Non-toxic
- The ingress of atmospheric oxygen by permeation into the entire heating and cooling water system, make-up water and similar must be reliably minimised during operation.

3.5 Inadmissible operating conditions

The devices are not suited for the following conditions.

- In mobile system operation
- For outdoors operation
- For the use with mineral oils
- For the use with flammable media
- For the use with distilled water



Notice!

Changes to the hydraulic system or interference with the interconnection are strictly prohibited.

3.6 Residual risks

This device has been manufactured to the current state of the art. However, some residual risk cannot be excluded.



Caution – risk of burning!

- Excessive surface temperatures in heating systems can cause skin to burn.
 - Wait until surfaces have cooled down or wear protective gloves.
 - The operator is required to attach corresponding warning notes in the device vicinity.



Caution – risk of injury!

- Incorrect installation or service work may cause burns and other injuries at the connections when hot water or steam suddenly escape at pressure.
 - Ensure proper installation.
 - Ensure that the system is de-pressurised before performing service work at the connections.



Warning – large weight!

- The devices are very heavy. Thus, there is a risk of physical damage and accidents.
 - Use only lifting gear suitable for transport and installation.

4 Description of the device

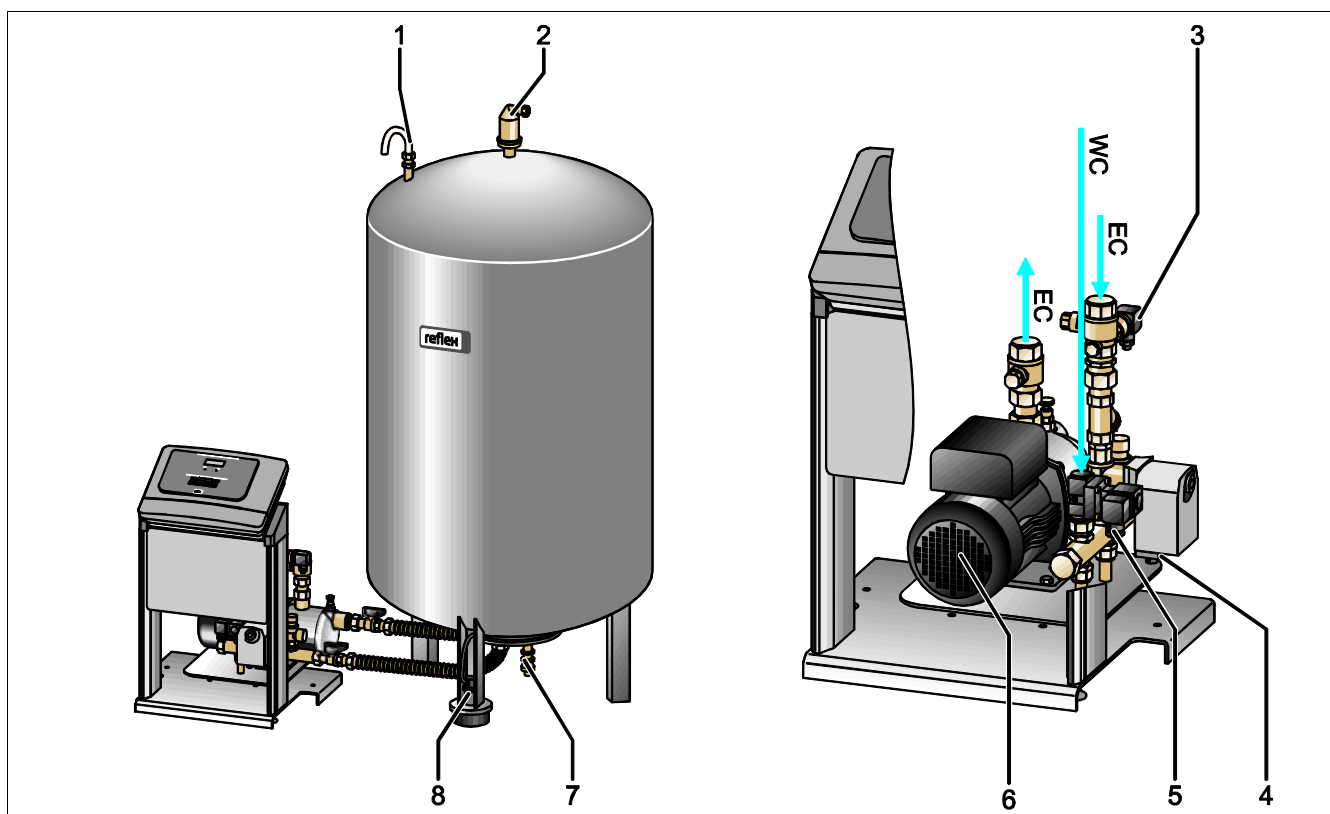
4.1 Description

The Variomat is a pump-controlled pressure maintaining, make-up and degassing station for heating and cooling water systems. The Variomat is essentially a controller with pump and at least one expansion tank. A diaphragm in the extension tank separates the same into an air and a water space, preventing the penetration of atmospheric oxygen into the expansion water.

The Variomat provides the following safety features:

- Optimisation of all pressure maintaining, degassing and make-up processes.
 - No direct intake of air thanks to a regulation of the pressure maintenance with automatic make-up.
 - No circulation issues caused by free bubbles in the circuit water.
 - Reduced corrosion damage due to oxygen removal from fill and make-up water.

4.2 Overview



1	"VE" aeration and de-aeration
2	"DV" degassing valve
3	"PIS" pressure transducer
4	"PV" overflow valve
5	"WV" make-up valve

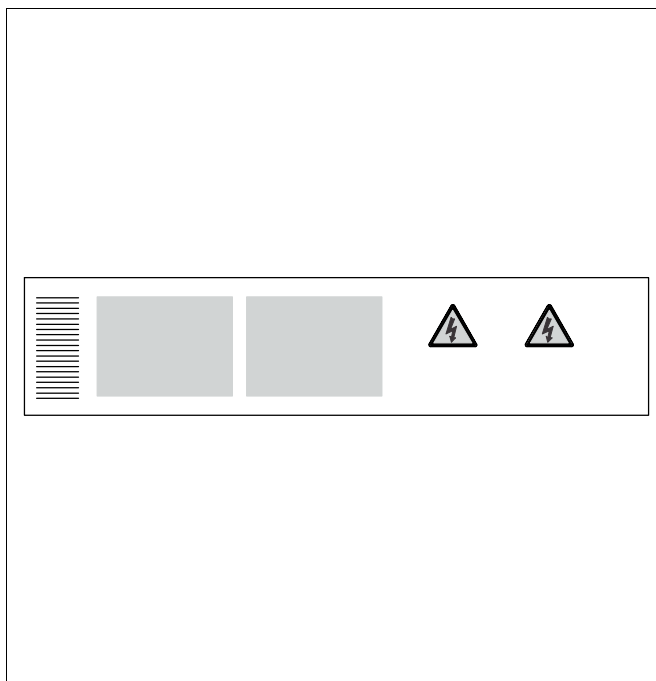
6	"PU" pump
7	"FD" feed and drain cock
8	"LIS" level sensor
WC	Make-up connection
EC	Degassing connection <ul style="list-style-type: none"> • Gas-rich water inlet • Degassed water outlet

4.3 Identification

4.3.1 Nameplate

The nameplate provides manufacturer information, year of manufacture, serial number, and technical data.

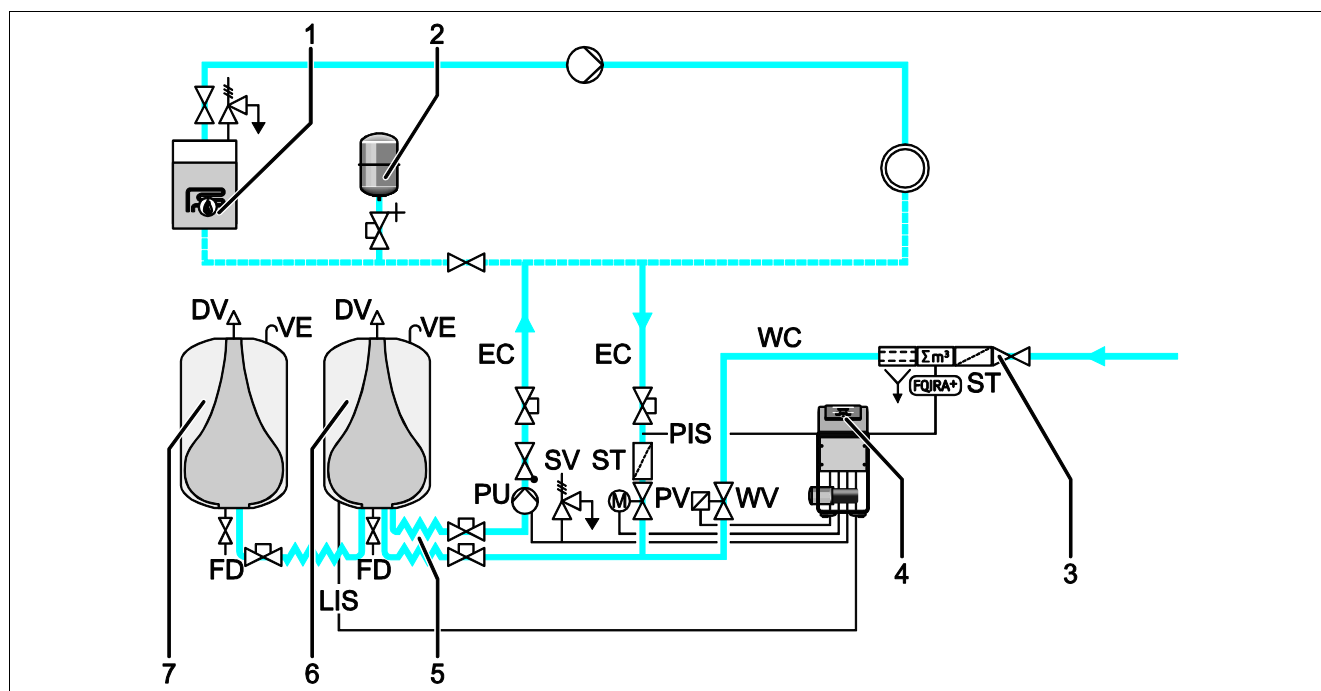
Information on nameplate	Meaning
Type	Device name
Serial No.	Serial number
min. / max. allowable pressure P	Minimum/maximum permissible pressure
max. continuous operating temperature	Maximum temperature for continuous operation
min. / max. allowable temperature / flow temperature TS	Minimum/maximum permissible temperature/TS flow temperature
Year built	Year of manufacture
min. operating pressure set up on shop floor	Factory-set minimum operating pressure
at site	Set minimum operating pressure
max. pressure safety valve factory - a line	Factory-set opening pressure of the safety valve
at site	Set opening pressure of the safety valve



4.3.2 Type code

No.		Type code
1	Control unit with number of pumps "1"	Variomat VS 1, VG 500 I, VF 500 I 1 2 3
2	Primary tank with 500 litre volume	
3	Secondary tank with 500 litre volume	

4.4 Function



1	Heating system
2	"MAG" pressure expansion tank
3	Reflex Fillset Impulse, see chapter 4.6 "Optional equipment and accessories" on page 13 .
4	Control unit
5	Hydraulic inlets <ul style="list-style-type: none"> • For gas-rich water • For degassed water
6	Air space, "VG" primary tank
7	Air space, "VG" secondary tank
ST	Dirt trap
FQIRA+	Contact water meter
WC	Make-up line

WV	Make-up valve
PIS	Pressure sensor
PV	Overflow limiter (motor ball valve)
PU	Pump (pressure maintenance)
SV	Safety valve
EC	Expansion line <ul style="list-style-type: none"> • For gas-rich water • For degassed water
FD	Feed and drain cock
LIS	Pressure pick-up
DV	Degassing valve
VE	Aeration and de-aeration

The device is a pressure maintaining station for heating and cooling water systems. It is used for maintaining pressure, making-up and degassing the water in heating and cooling systems. It comprises a control unit consisting of a controller with hydraulics and at least one expansion tank.

Expansion tank

One "VG" primary tank and multiple optional "VF" secondary tanks may be connected. A diaphragm separates the tanks into an air and a water space, preventing the penetration of atmospheric oxygen into the expansion water. The "VE" line connects the air space with the atmosphere. The "VG" primary tank is hydraulically flexibly connected to the control unit. The function of the "LIS" level measuring using a pressure pick-up is thus ensured.

Control unit

The control unit contains the hydraulic system and the controller. The "PIS" pressure transducer records the pressure and the "LIS" pressure pick-up registers the level; both values are displayed at the controller.

Maintaining pressure

The pressure in the system rises when the water is heated. When the pressure set at the controller is exceeded, the "PV" overflow valve opens and drains water from the system into the "VG" primary tank, using the "EC" expansion line. The pressure within the system drops. The pressure in the system drops when the water cools. When the pressure drops below the set value, the "PU" pump is activated and uses the "EC" expansion line to transport water from the "VG" primary tank back into the system. The pressure in the system rises. The controller ensures that the pressure is maintained, further supported by the stabilisation provided by the "MAG" expansion tank.

Degassing

Two "EC" expansion lines are required to degas the system water. One line is intended for gas-rich water from the system, and the other one serves to return the degassed water to the system. During the degassing action, the "PU" pump and the "PV" overflow valve are in operation. This transports a gas-rich partial flow of the system water V through the de-pressurised "VG" primary tank. Atmospheric pressure is used to separate the free and dissolved gases and to discharge them through the "DV" degassing valve. The controller ensures the hydraulic equalisation by regulating the stroke of a motor ball valve used as the "PV" overflow valve. There are three different modes for this process: continuous, interval or run-on degassing.

Make-up

When the water level in the "VG" primary tank falls below the minimum, the "WV" make-up valve opens until the set level is again reached. During the make-up process, the number of requests, the time and the make-up duration within a cycle are monitored. Using a FQIRA+ contact water meter, the system monitors each individual make-up volume and the overall make-up volume.

4.5 Scope of delivery

The scope of delivery is described in the shipping document and the content is shown on the packaging. Immediately after receipt of the goods, please check the shipment for completeness and damage. Please notify us immediately of any transport damage.

Basic pressure-maintaining equipment:

- The device on a pallet.
 - Control unit and "VG" primary tank.
 - Connection kit in cardboard box and add-on components in a plastic bag for the "VG" primary tank.
 - Plastic sleeve with operating manual.

Optional equipment and accessories:

- Thermal insulation for the "VG" primary tank.
- "VF" secondary tanks with add-on components in a plastic bag and a set of flexible hoses.

4.6 Optional equipment and accessories

The following optional equipment and accessories are available for this device:

- Fillset for make-up with water.
 - Fillset with integrated back flow preventer, water meter, dirt trap, and locking mechanisms for the "WC" make-up line.
- Fillset Impulse with FQIRA+ contact water meter for make-up with water.
- Servitec for make-up and degassing.
- Fillsoft for softening the make-up water from the public water network.
 - Fillsoft is installed between Fillset and the device. The device controller evaluates the make-up quantities and signals a required replacement of the softening cartridges.
- Enhancements for the device controller:
 - I/O module for standard communication.
 - Master-Slave-Connect for master controllers for maximum 10 devices.
 - Bus modules:
 - Lonworks Digital
 - Lonworks
 - Profibus DP
 - Ethernet
- Diaphragm rupture monitor.



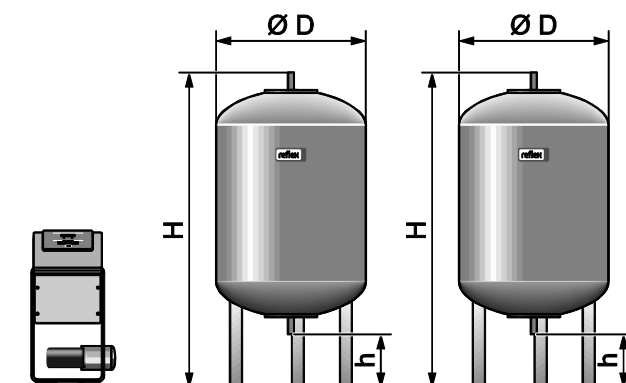
Notice!

Separate operating instructions are supplied with accessories.

5 Technical data

Control unit

Type	VS 1
Part No.	8910100
Electric output	0.75 kW
Voltage	230 V
Frequency	50 Hz
Power Supply	Plug
Width	530 mm
Height	680 mm
Depth	580 mm
Weight	25 kg
Mechanical connection in inches	2 x G1



Tanks

Type	200	300	400	500	600	800	1000
"VG" primary tank, Article No.	8600011	8600111	8600211	8600311	8600411	8600511	8600611
"VF" secondary tank, Article No.	8610000	8610100	8610200	8610300	8610400	8610500	8610600
"VW" thermal insulation for heating systems, Article No.	7985700	7986000	7995600	7983900	7995700	7993800	7993900
Diameter Ø "D"	634 mm	634 mm	740 mm	740 mm	740 mm	740 mm	740 mm
Height "H"	1060 mm	1360 mm	1345 mm	1560 mm	1810 mm	2275 mm	2685 mm
Height "h"	146 mm	146 mm	133 mm	133 mm	133 mm	133 mm	133 mm
Weight	37 kg	54 kg	65 kg	78 kg	94 kg	149 kg	156 kg
Connection in inch	G1	G1	G1	G1	G1	G1	G1

Type	1000	1500	2000	3000	4000	5000
"VG" primary tank, Article No.	8600705	8600905	8601005	8601205	8601305	8601405
"VF" secondary tank, Article No.	8610705	8610905	8611005	8611205	8611305	8611405
"VW" thermal insulation for heating systems, Article No.	7986800	7987000	7987100	7993200	7993300	7993400
Diameter Ø "D"	1000 mm	1200 mm	1200 mm	1500 mm	1500 mm	1500 mm
Height "H"	2130 mm	2130 mm	2590 mm	2590 mm	3160 mm	3695 mm
Height "h"	350 mm	350 mm	350 mm	380 mm	380 mm	380 mm
Weight	320 kg	465 kg	565 kg	795 kg	1080 kg	1115 kg
Connection in inch	G1	G1	G1	G1	G1	G1

6 Installation



Danger – Electric shock!

- Serious injury or death due to electric shock.
 - Any system in which the device is to be installed must be de-energised.
 - Ensure that the system is locked and cannot be switched on by other personnel.
 - Installation work for the electric connection of the device must be carried out by an authorised electrician in compliance with electrical engineering regulations.



Caution – risk of injury!

- Incorrect installation or service work may cause burns and other injuries at the connections when hot water or steam suddenly escape at pressure.
 - Ensure proper installation.
 - Ensure that the system is de-pressurised before performing service work at the connections.



Caution – risk of burning!

- Excessive surface temperatures in heating systems can cause skin to burn.
 - Wait until surfaces have cooled down or wear protective gloves.
 - The operator is required to attach corresponding warning notes in the device vicinity.



Caution – Risk of injury due to falls or bumps!

- Bruising from falls or bumps at system components during installation.
 - Wear personal protective equipment (helmet, protective clothing, gloves, safety boots).



Notice!

- The proper installation and commissioning must be confirmed in the installation, commissioning and maintenance certificate. This certificate is prerequisite for any warranty claim.
 - Have the Reflex Customer Service carry out commissioning and the annual maintenance.

6.1 Installation conditions

6.1.1 Incoming inspection

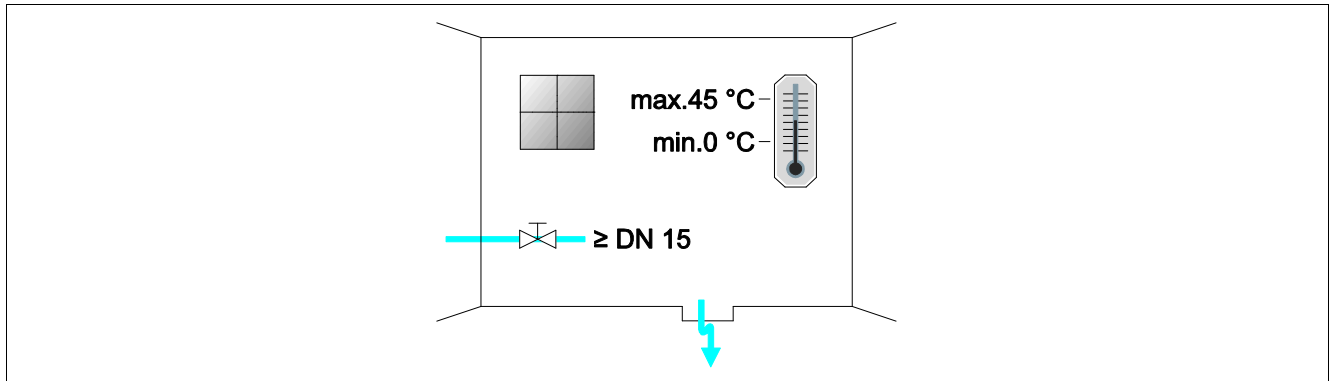
Prior to shipping, this device was carefully inspected and packed. Damages during transport cannot be excluded.



Notice!

After receipt of the goods, please check the shipment for completeness and damage. Document any transport damage. Contact the shipper to register a claim for damage.

6.2 Preparatory work



Conditions for the device installation:

- No access by unauthorised personnel.
- Frost-free, well ventilated room.
 - Room temperature 0 °C to 45 °C.
- Level, stable flooring.
 - Ensure sufficient bearing strength of the flooring before filling the "VG" and "VF" tanks.
 - Ensure that the control unit and the "VG" and "VF" tanks are installed on the same level.
- Filling and dewatering option.
 - Provide a DN 15 filling connection according to DIN 1988 T 4.
 - Provide an optional cold water inlet.
 - Prepare a drain for the drain water.
- Electric connection: 230 V~, 50 Hz, 16 A with upstream ELCB: Tripping current 0.03 A.
- Use only approved transport and lifting gear.
 - The load fastening points at the "VG" and "VF" tanks must be used only as installation resources.

6.3 Execution



Attention! – Damage caused by improper installation

- Remember that the connection of pipelines or equipment originating with the system may cause additional stresses to the device.
 - Ensure a stress-free installation of the pipe connections between the device and the overall system.

For installation, proceed as follows:

- Position the device.
- Complete the "VG" primary tank and the optional "VF" secondary tanks.
- Create the water-side connections of the control unit to the system.
- Create the interfaces according to the terminal plan.
- Connect the water connection optional "VF" secondary tanks to each other and to the "VG" primary tank.



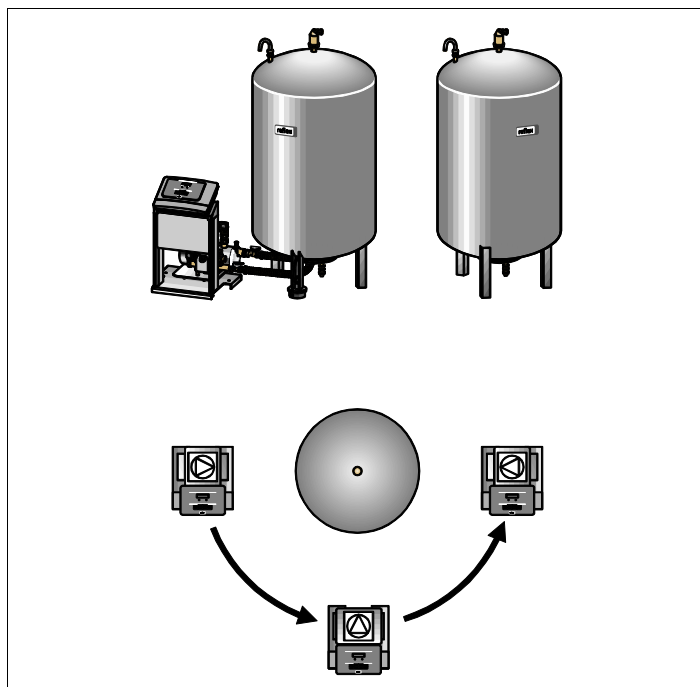
Notice!

For installation, note the operability of the valves and the inlet options of the connecting lines.

6.3.1 Positioning

Determine the positions for the control unit and the "VG" and "VF" tanks (if used).

- The control unit can be installed on either side or in front of the "VG" primary tank. The distance of the control unit to the primary tank results from the connection set supplied.



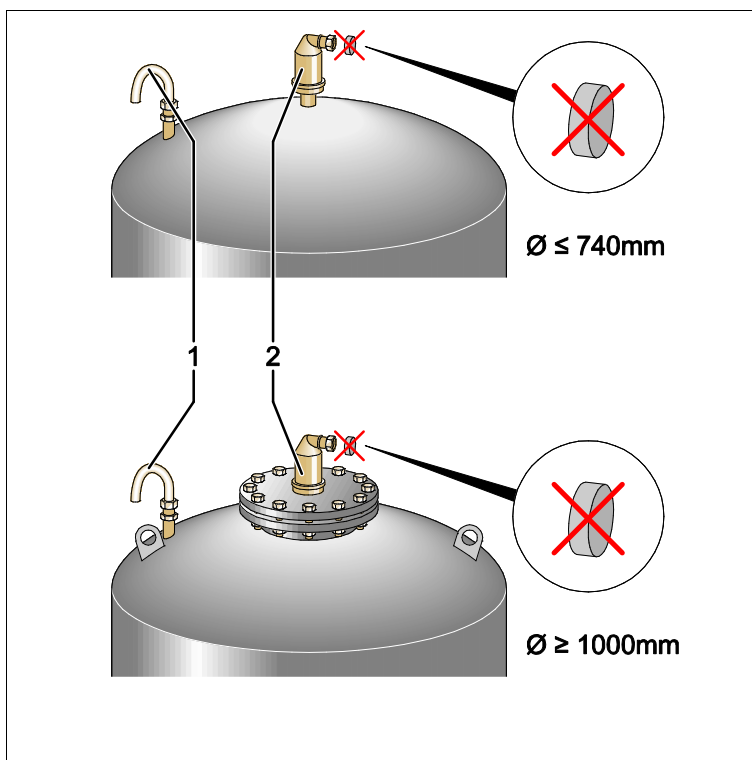
6.3.2 Installation of add-on components for the tanks

The add-on components are packed in plastic bags and attached to the base of the devices.

- For "VG" and "VF" tanks up to 740 mm Ø.
 - "DV" degassing valve and reducing sleeve Rp 1/2 × Rp 3/8.
 - "VE" equalisation elbow.
- For "VG" and "VF" tanks up to 1000 mm Ø.
 - "DV" degassing valve and reducing sleeve Rp 1 × Rp 3/8.
 - "VE" equalisation elbow.

For add-on components, proceed as follows:

1. Seal the "DV" degassing valve and the reducing sleeve and assemble.
2. Install the assembly at the connection of the corresponding tank.
3. Remove the protective cap from the "DV" degassing valve.
4. Use the clamping ring screw connection to install the "VE" equalisation elbow for aeration and de-aeration at the tanks.



1	"VE" equalisation elbow	2	"DV" degassing valve with reducing sleeve
---	-------------------------	---	-------------------------------------------

6.3.3 Tank installation



Attention! – Damage caused by improper installation

- Remember that the connection of pipelines or equipment originating with the system may cause additional stresses to the device.
 - Ensure a stress-free installation of the pipe connections between the device and the overall system.

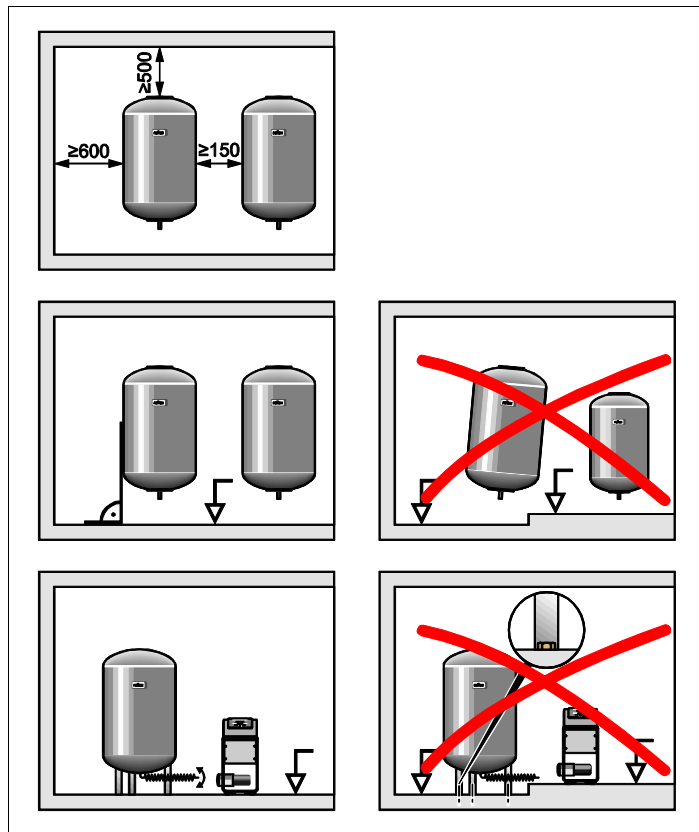


Attention! – Equipment damage

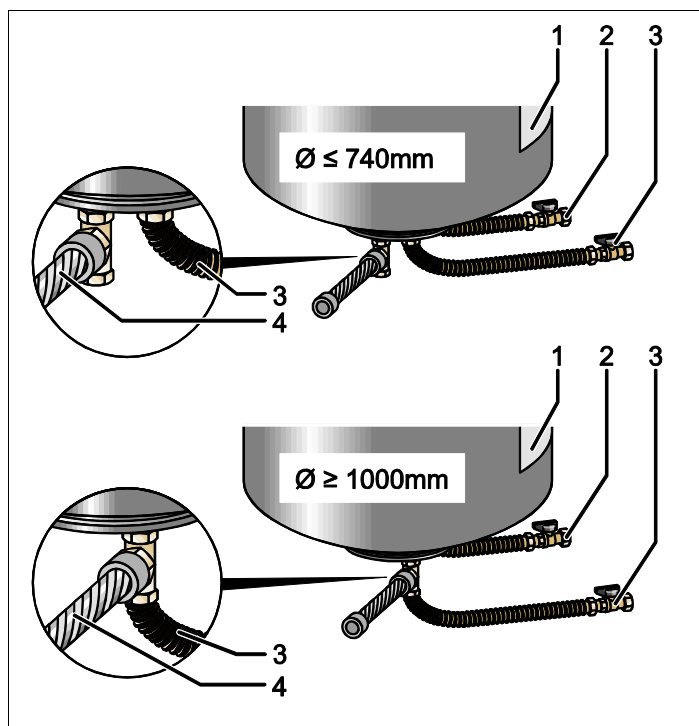
- The pump will be damaged if it is permitted to run dry.
 - Ensure that the connections for the overflow collector and the pump are not interchanged.
 - Ensure the correct connection of the pump to the primary tank.

Comply with the following notes regarding the installation of the "VG" primary tank and the "VF" secondary tanks:

- All flange openings at the tanks are viewing and maintenance openings. Install the "VG" primary tank and the "VF" secondary tanks, if provided, with sufficient spaces at the sides and the top.
- Install the "VG" and "VF" tanks on a level plane.
- Ensure rectangular and free-standing position of the tanks.
- If you use "VF" secondary tanks in addition to the "VG" primary tank, ensure that all tanks have the same type and dimensions.
- Do not attach the tanks to the flooring to ensure the functioning of the "LIS" level sensor.
- Install the control unit on the same level as the tanks.



- Align the "VG" primary tank.
 - The adhesive label (1) and the connections must point to the connection points at the control unit.
 - The distance of the primary tank to the control unit must match the length of the connection set.
- Connect the connection set (2) and (3) with the screw fittings and gaskets to the connections at the lower tank flange of the "VG" primary tank.
 - For tanks up to 740 mm Ø:
 - Connect the connection set (2) and (3) to the two free 1-inch barrel nipples at the tank flange.
 - Connect the connection set (4) of the secondary tank to the T-joint at the outlet of the tank flange.
 - For tanks from 1000 mm Ø:
 - Connect the connection set (2) to the 1-inch barrel nipple of the tank flange.
 - Connect the connection sets (3) and (4) to the T-joint at the 1-inch barrel nipple of the tank flange.



1	Adhesive label	3	"Pump" connection set
2	"Overflow collector" connection set	4	"VF" secondary tank connection set

Notice!

If necessary, install the supplied connection set (4) at the "VF" secondary tank. Connect the connection set (4) with a user-supplied pipeline to the "VF" primary tank.

6.3.4 Hydraulic connection

6.3.4.1 Connection to the facility system



Caution – risk of burning!

- Hot water vapour can cause burns to skin and eyes.
 - Install the blow-off line from the control unit's safety valve so that a hazard to persons in the vicinity is excluded.



Attention! – Damage caused by improper installation

- Remember that the connection of pipelines or equipment originating with the system may cause additional stresses to the device.
 - Ensure a stress-free installation of the pipe connections between the device and the overall system.

Connection to the "VG" primary tank

The control unit is positioned to the "VG" primary tank as determined by the selected installation variant, and is connected to the tank using its connection set, see chapter 6.3.3 "Tank installation" on page 19 .

The connections to the system are identified by adhesive labels on the control unit:

Pumpen
Zur Anlage

Pump to system connection

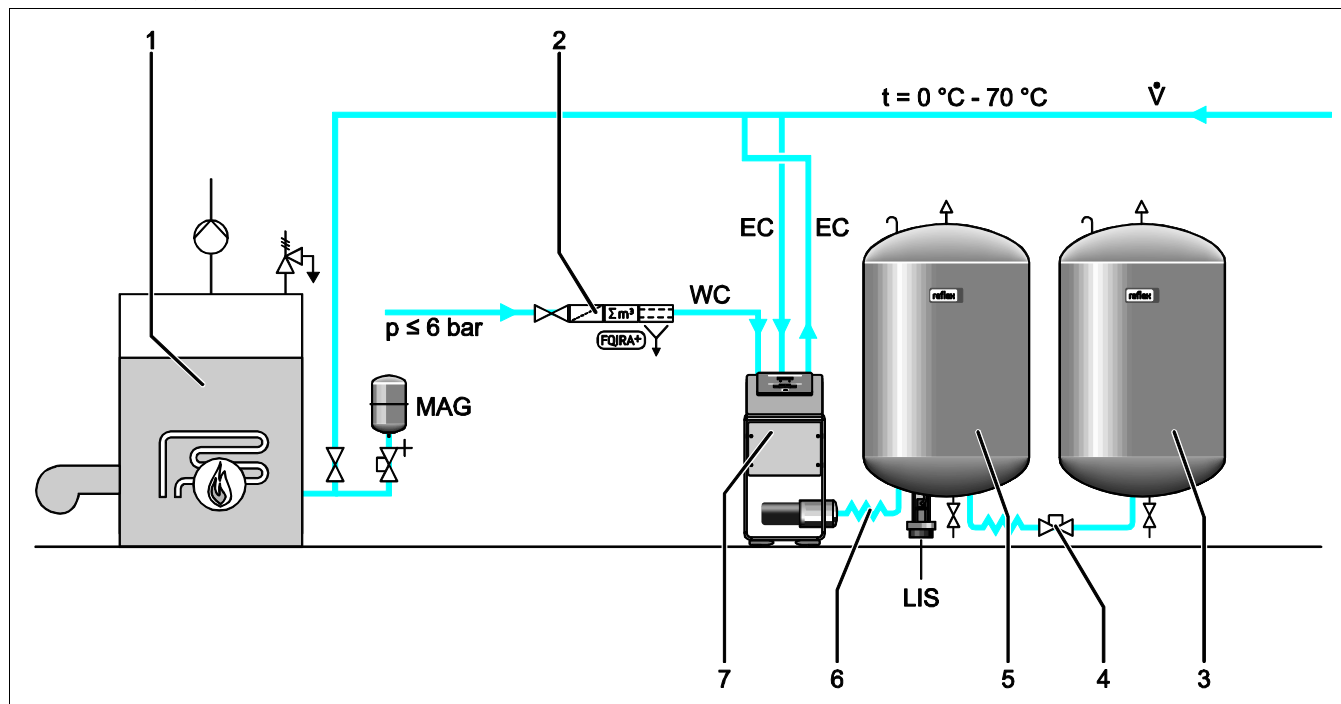
Überströmung
Zur Anlage

Overflow valve to system
connection

Nachspeisung
Zum Behälter

Make-up to system connection

Connection to the system



1	Heat generator
2	For optional equipment and accessories, see chapter 4.6 "Optional equipment and accessories" on page 13 .
3	"VF" secondary tank
4	Reflex rapid-action coupling R 1 x 1
5	"VG" primary tank
6	Connection set, "VG" primary tank

7	Control unit
EC	Degassing line <ul style="list-style-type: none"> Gas-rich water from the system Degassed water to the system
LIS	"LIS" level sensor
WC	Make-up line
MAG	Pressure expansion tank

If required, install a diaphragm expansion tank $MAG \geq 35$ litres (Reflex N, for example). It reduces the switching frequency and can be also used in the individual protection of the heat generators. According to DIN / EN 12828, the installation of valves between the device and the heat generator is required for heating systems. Otherwise, protected shut-off devices must be installed.

**Notice!**

Due to the optimal degassing capacity of the device, we recommend the installation of a diaphragm expansion tank $MAG \geq 35$ litre (Reflex N, for example).

"EC" expansion lines

Because of the degassing function, you must install two "EC" expansion lines.

- One line from the system for the gas-rich water.
- One line to the system for the degassed water.

The "DN" nominal connection diameter for the "EC" expansion lines must be designed for the " P_0 " minimum operating pressure.

DN25:

$P_0 \geq 2,0$ bar

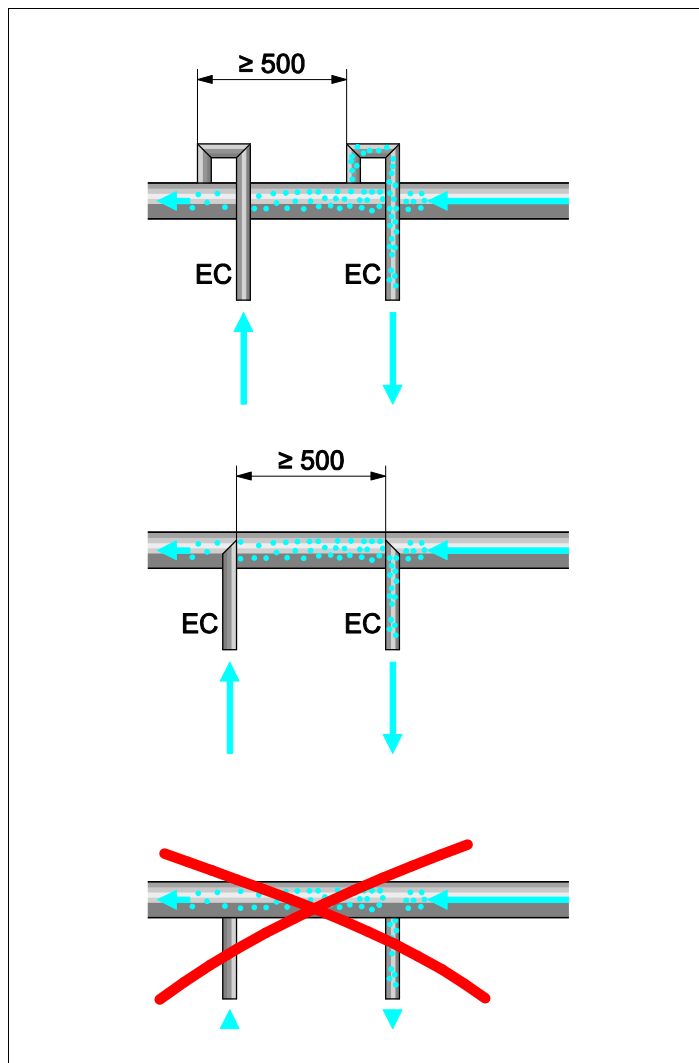
DN32:

$P_0 = 0,5$ bar – $2,0$ bar

see chapter 7.2 "Determine the P_0 minimum operating pressure for the controller" on page 35 .

The "DN" nominal connection diameter applies to an expansion line length of up to 10 metres. Beyond this length, select the next larger dimension. Integrate with the "V" main flow volume of the system. Viewed in system flow direction, you must integrate the gas-rich expansion line upstream of the expansion line transporting the degassed water.

Ensure that particulate dirt cannot enter and thus creating an overload of the "ST" dirt trap. Connect the "EC" expansion lines according to the following installation variants.



Notice!

The water temperature at the connection point of the "EC" expansion lines must be in the range of $0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$. The use of in-line tanks does not increase the application range. Because the thermal protection is not ensured due to the flow during the degassing phase.

6.3.4.2 Make-up line

"WC" make-up line

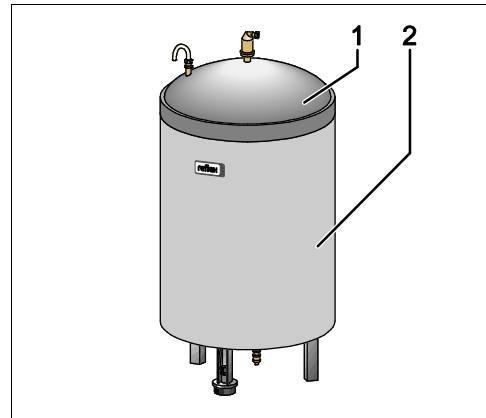
See Chapter "Switching and make-up variants" for the various make-up variants, see chapter 6.4 "Switching and make-up variants" on page 26 . If you don't connect the automatic water make-up to the device, you must close the connection of the "WC" make-up line with a R ½ " blind plug. Prevent a potential device fault by ensuring manual water make-up. Install at least one "ST" dirt trap with a mesh size ≤ 0.25 mm close upstream to the make-up solenoid valve. Install a short line between the "ST" dirt trap and the solenoid valve.

**Notice!**

Use a pressure reducer in the "WC" make-up line if the idle pressure exceeds 6 bar.

6.3.5 Fitting the thermal insulation

Install the "VW" thermal insulation (2) around the "VG" primary tank (1) and close the insulation with the zip fastener.

**Notice!**

For heating systems, insulate the "VG" primary tank and the "EC" expansion lines against heat loss. The cover of the primary tank does not require insulation, as there is space between the diaphragm and the tank wall. The "VF" secondary tanks do not require insulation either.

**Notice!**

Condensate formation requires insulation by the user.

6.3.6 Fitting the level sensor



Attention! – Equipment damage

- Incorrect installation may result in damages to the "LIS" level sensor, malfunctioning and incorrect measurements from the pressure pick-up.
 - Comply with the instructions regarding the installation of the pressure pick-up.

The "LIS" level sensor uses a pressure pick-up. This pressure pick-up is to be installed after the "VG" primary tank has been placed at its final position, see chapter 6.3.3 "Tank installation" on page 19 . Comply with the following instructions:

- Remove the transport securing device (squared timber) at the vessel base of the "VG" primary tank.
- Replace this transport securing device with the pressure pick-up.
 - In the case of a tank volume of 1000 l (Ø 1000 mm) or more, use the supplied screws to attach the pressure pick-up at the vessel base of the primary tank.
- The vessel base must not be subject to stress after the pressure pick-up has been installed.
 - Avoid shock stresses by a subsequent alignment of the vessel, for example.
- Use flexible hoses to connect the primary tank and the, if provided, the first secondary "VF" tank.
 - Use only the supplied connection sets.
- Perform a null balancing of the filling level when the primary tank is aligned and fully emptied, see chapter 7.7 "Parametrising the controller in the Customer menu" on page 41 .

Standard values for level measurements:

Primary tank	Measuring range
200 l	0 – 4 bar
300 – 500 l	0 – 10 bar
600 – 1000 l	0 – 25 bar
1500 – 2000 l	0 – 60 bar
3000 – 5000 l	0 – 100 bar

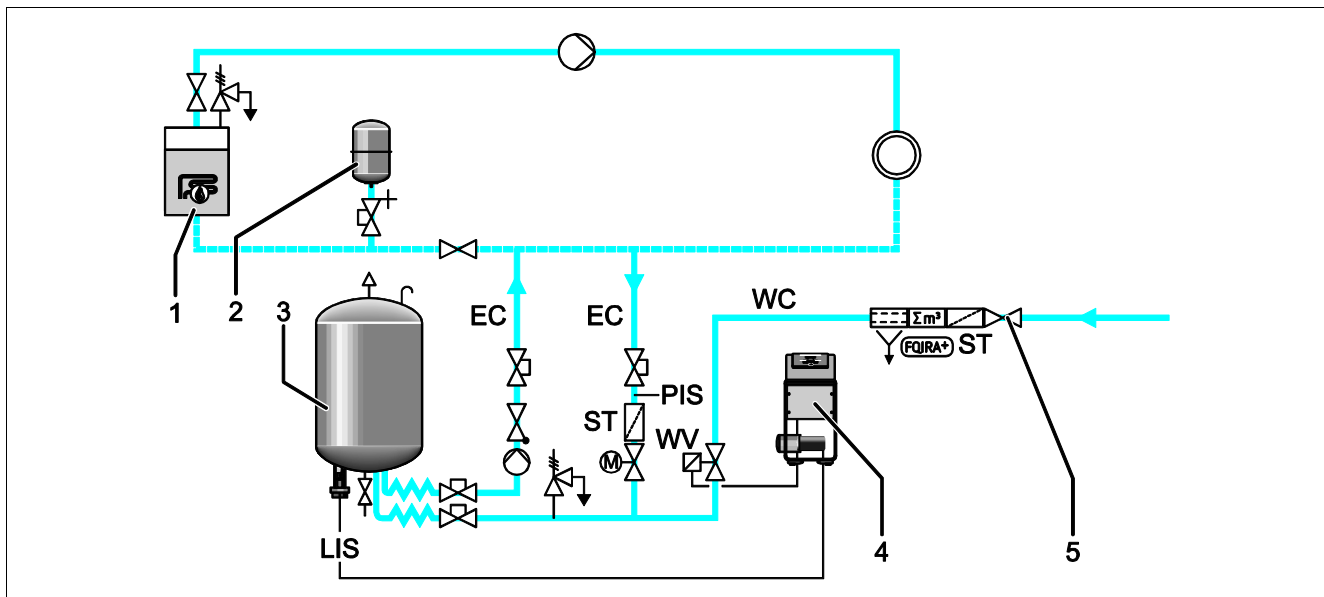
6.4 Switching and make-up variants

The filling level is recorded in the "VG" primary tank by the "LIS" level sensor and evaluated in the controller. When the water level falls below the value specified in the controller's customer menu, the "WV" make-up valve opens.

Notice!

To complete the make-up function from the drinking water system, Reflex offers the Fillset with integrated system separator and Fillsoft softening equipment. – Fillsoft is installed between Fillset and the device, see chapter 4.6 "Optional equipment and accessories" on page 13 .

Using a single-tank system



1	Heat generator
2	"MAG" pressure expansion tank
3	"VG" primary tank
4	Control unit
5	Reflex Fillset, see chapter 4.6 "Optional equipment and accessories" on page 13 .
ST	Dirt trap

WC	Make-up line
PIS	Pressure transducer
WV	Make-up solenoid valve
EC	Degassing line <ul style="list-style-type: none"> • For gas-rich water from the system. • For degassed water into the system.
LIS	Level sensor

Single-tank system ≤ 350 kW, water temperature < 100 °C.

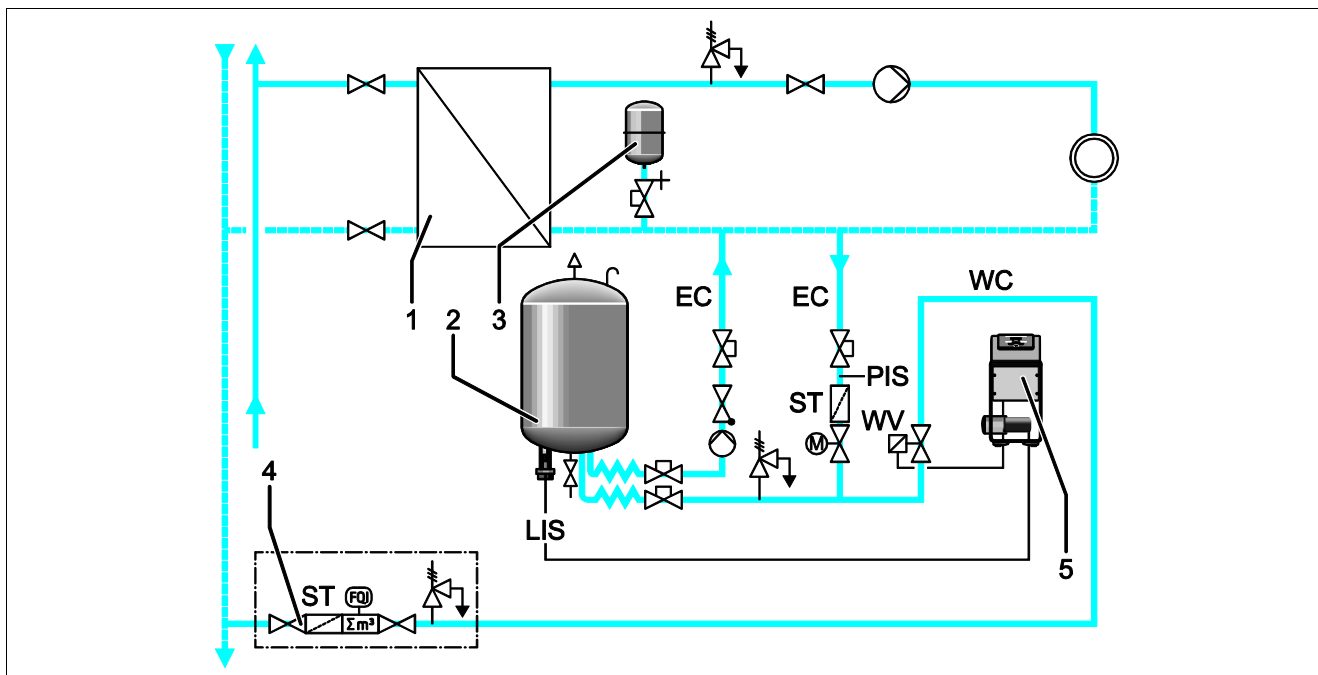
- Preferably, you should use the Reflex Fillset with integrated system separator when using drinking water for make-up..
 - If you don't use a Reflex Fillset, you must use an "ST" dirt trap with a mesh size ≥ 0.25 mm for the make-up.

Notice!

The quality of the make-up water must comply with the applicable standards such as VDI 2035.

- If necessary, use Reflex Fillsoft, see chapter 4.6 "Optional equipment and accessories" on page 13 for softening the make-up water.

Using a district heating substation



1	District heating substation
2	"VG" primary tank
3	"MAG" pressure expansion tank
4	User-supplied make-up unit
5	Control unit
WC	Make-up line

PIS	Pressure transducer
WV	Make-up solenoid valve
ST	Dirt trap
EC	Degassing line <ul style="list-style-type: none"> For gas-rich water from the system. For degassed water into the system.
LIS	Level sensor

District heating water is particularly suited as make-up water.

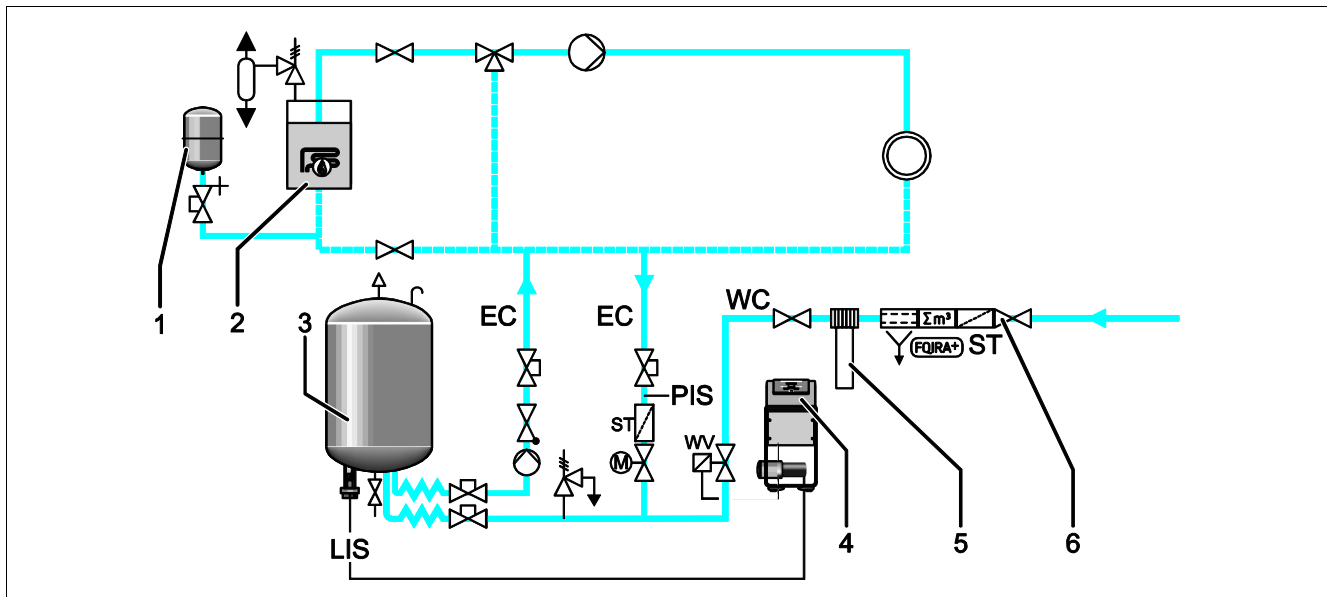
- Water treatment is not necessary.
- Use an "ST" dirt trap with a mesh size ≥ 0.25 mm for the make-up.



Notice!

You require approval by the supplier of the district heating water.

Use in a system with central return flow admixture



1	"MAG" pressure expansion tank
2	Heat generator
3	"VG" primary tank
4	Control unit
5	Reflex Fillsoft, see chapter 4.6 "Optional equipment and accessories" on page 13 .
6	Reflex Fillset Impulse, see chapter 4.6 "Optional equipment and accessories" on page 13 .

WC	Make-up line
PIS	Pressure transducer
WV	Make-up solenoid valve
ST	Dirt trap
EC	Degassing line <ul style="list-style-type: none"> • For gas-rich water from the system. • For degassed water into the system.
LIS	Level sensor

Using a softening system for the water make-up.

- Always integrate the device in the "V" main volume flow to ensure degassing the system water. It is the system side in systems with central return flow admixture or hydraulic switching points. The tank of the heat generator must be fitted with an individual protective device.
- When using Reflex Fillsoft softening systems, always install the Fillset Impulse.
 - The device controller evaluates the make-up quantities and signals a required replacement of the softening cartridges.

**Notice!**

The quality of the make-up water must comply with the applicable standards such as VDI 2035.

6.5 Electrical connection



Danger – Electric shock!

- Serious injury or death due to electric shock.
 - Any system in which the device is to be installed must be de-energised.
 - Ensure that the system is locked and cannot be switched on by other personnel.
 - Installation work for the electric connection of the device must be carried out by an authorised electrician in compliance with electrical engineering regulations.



Danger – Electric shock!

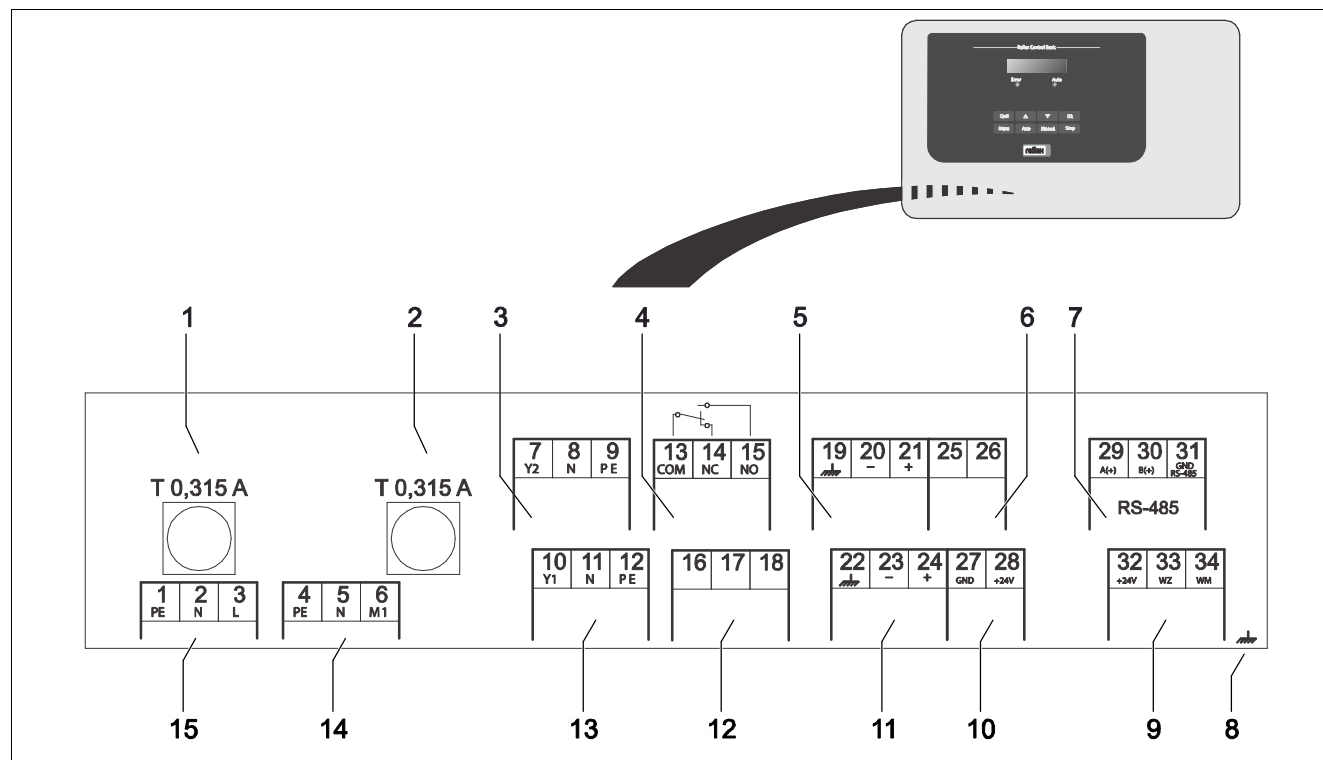
- Serious injury or death due to electric shock. Some parts of the main board may still carry 230V voltage even with the device physically isolated from the 230 V power supply.
 - Before you remove the covers, completely isolate the device controller from the power supply.

The following descriptions apply to standard systems and are limited to the necessary user-provided connections.

1. Shut down the system and secure it against unintentional reactivation.
2. Remove the cover.
3. Install a screwed cable gland suitable for the respective cable. M16 or M20, for example.
4. Thread all cables to be connected through the cable gland.
5. Connect all cables as shown in the terminal diagram, see chapter 6.5.1 "Terminal diagram" on page 30 .
 - Note that the fusing for the device connection is to be provided by the user, see chapter 5 "Technical data" on page 14 .

When all connections have been made according to the terminal diagram, install the cover and connect the the mains cable with the 230 V power supply.

6.5.1 Terminal diagram



1	"L" fuse for electronics and solenoid valves
2	"N" fuse for solenoid valves
3	Overflow valve (not for motor ball valve)
4	Group message
5	Optional for second pressure value
6	Motor ball valve (control connection)
7	RS-485 interface
8	Shielding

9	Digital inputs <ul style="list-style-type: none"> Water meter Insufficient water
10	Motor ball valve (energy connection)
11	Pressure analogue input
12	External make-up request
13	Make-up valve
14	"PU" pump
15	Mains supply

Terminal number	Signal	Function	Wiring
1	PE	230 V power supply via mains cable and plug.	Pre-wired
2	N		
3	L		
4	PE	Pump for maintaining the pressure.	Pre-wired
5N	N		
6 M1	M 1		
7	Y2	Overflow solenoid valve • Not used in a standard device.	---
8	N		
9	PE		
10	Y 1	Valve to control the water make-up.	Pre-wired
11	N		
12	PE		
13	COM	Group message (floating).	User, optional
14	NC		
15	NO		
16	Not assigned	External make-up request.	---
17	Make-up (230 V)	• To be used only upon consultation with the Reflex Customer Service.	
18	Make-up (230 V)		
19	PE shield	Level analogue input. • Display at the controller. • Activation of the make-up. • Dry-running protection of the pump.	Pre-wired, sensor plug must be attached on-site
20	- Level (signal)		
21	+ Level (+ 18 V)		
22	PE (shield)	Pressure analogue input. • Display at the controller. • Control of pressure maintenance.	Pre-wired
23	- Pressure (signal)		
24	+ Pressure (+ 18 V)		
25	0 – 10 V (correcting variable)	Motor ball valve in the overflow line to control the pressure maintenance.	Pre-wired
26	0 – 10 V (feedback)		
27	GND		
28	+ 24 V (supply)		
29	A	RS-485 interface.	User, optional
30	B		
31	GND		
32	+ 24 V (supply) E1	Supply for E1 and E2.	Pre-wired
33	E1	Contact water meter (in Fillset, for example), see chapter 4.6 "Optional equipment and accessories" on page 13 . • Evaluation of the make-up. – If contact 32/33 is closed = meter pulse.	User, optional
34	E2	Insufficient water switch. • Not used in this device. – If contact 32/34 is closed = OK.	---

6.5.2 RS-485 interface

Use this interface to retrieve all controller data and to enable the communication with control centres or other devices.

The following data can be requested:

- Pressure and level.
- Pump operating states.
- Operating states of the motor ball valve in the overflow line.
- Operating states of make-up via solenoid valve.
- Cumulated quantity of the "FQIRA+" contact water meter.
- All messages, see chapter 8.2.4 "Messages" on page 53 .
- All entries in the fault memory.



Notice!

If required, please contact the Reflex Customer Service for the protocol of the RS-485 interface, details of the connections and information about the accessories offered.

6.5.2.1 Connecting the RS-485 interface

- Use a shielded cable to connect the interface to terminals 29, 30, 31 of the main board in the control cabinet.
 - For connecting the interface, see chapter 6.5 "Electrical connection" on page 29 .
- When using the device with a control centre not supporting an RS-485 interface (RS-232, for example), you must use a corresponding adapter.



Notice!

- For connecting the interface use only a cable with these properties.
 - LJYCY (TP), $4 \times 2 \times 0.8$, maximum overall bus length 1000 m.

6.6 Installation and commissioning certificate

Data shown on the nameplate:	P_0
Type:	P_{SV}
Serial number:	

This device has been installed and commissioned in accordance to the instructions provided in the Reflex Installation, Operating, and Maintenance Manual. The settings in the controller match the local conditions.



Notice!

When any factory-set values of the device are changed, you must enter this information in the Maintenance certificate, see chapter 9.4 "Maintenance certificate " on page 61

For the installation

Place, date	Company	Signature

For the commissioning

Place, date	Company	Signature

7 Commissioning

**Notice!**

- The proper installation and commissioning must be confirmed in the installation, commissioning and maintenance certificate. This certificate is prerequisite for any warranty claim.
 - Have the Reflex Customer Service carry out commissioning and the annual maintenance.

7.1 Checking the requirements for commissioning

The device is ready for commissioning when the tasks described in Chapter Installation have been concluded. Comply with the following instructions for commissioning:

- The control unit is connected to the "VG" primary tank and the "VF" secondary tanks, if provided.
- The water connections of the "VG" and "VF" tanks to the systems are established.
- The "VG" and "VF" tanks are not filled with water.
- The valves for emptying the "VG" and "VF" tanks are open.
- The facility system is filled with water and gas-vented.
- The electrical connection has been created according to applicable national and local regulations.

7.2 Determine the P0 minimum operating pressure for the controller

The "P0" minimum operating pressure is determined by the location of the pressure maintaining device. The controller calculates the switching points for the "PV" overflow valve and the "PU" pump from the "P0" minimum operating pressure.

Actuating pressure for the safety valve " p_{sv} "

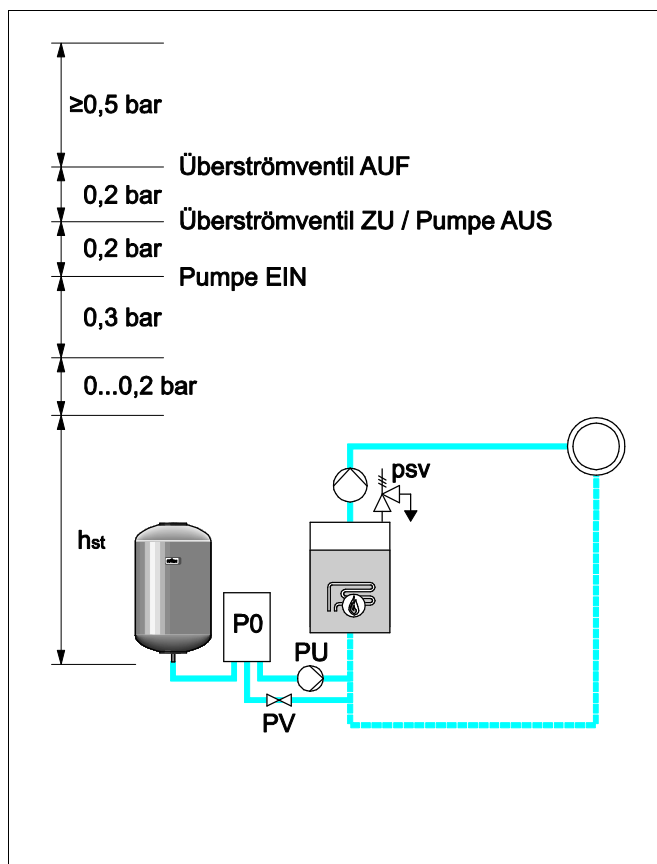
Overflow valve "OPEN" = final pressure " p_e "

Overflow valve "CLOSED" / Pump "OFF"

Pump "ON" = initial pressure " p_a "

Minimum operating pressure "P0"

Static pressure " p_{st} "



The "P0" minimum pressure is calculated as follows:

$P0 = p_{st} + p_D + 0.2 \text{ bar}^*$	Enter the calculated value in the start routine of the controller, see chapter 7.4 "Modifying the controller's start routine" on page 37 .
$p_{st} = h_{st}/10$	h_{st} in metres
$p_D = 0.0 \text{ bar}$	for safety temperatures $\leq 100 \text{ }^\circ\text{C}$
$p_D = 0.5 \text{ bar}$	for safety temperatures $= 110 \text{ }^\circ\text{C}$

*Addition of 0.2 bar recommended, no addition in extreme cases

Calculation example for "P0" minimum operating pressure:

Heating system: Static height 18 m, run-on temperature $70 \text{ }^\circ\text{C}$, safety temperature $100 \text{ }^\circ\text{C}$.

Calculation example:

$$P0 = p_{st} + p_D + 0.2 \text{ bar}^*$$

$$p_{st} = h_{st}/10$$

$$p_s = 18 \text{ m}/10$$

$$p_{st} = 1.8 \text{ bar}$$

$$p_D = 0.0 \text{ bar at a safety temperature of } 100 \text{ }^\circ\text{C}$$

$$P0 = 1.8 \text{ bar} + 0 \text{ bar} + 0.2 \text{ bar}$$

$$P0 = 2.0 \text{ bar}$$

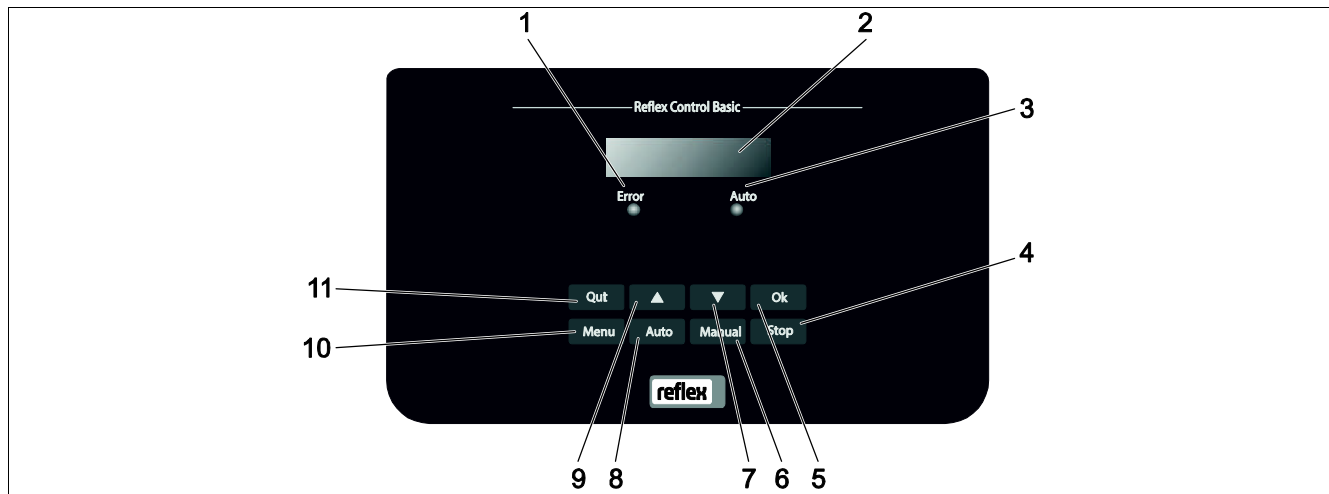


Notice!

Avoid dropping below the "P0" minimum operating pressure. Vacuum, vaporisation and cavitation are thus excluded.

7.3 Controller

7.3.1 Operator panel



1	Error LED • The LED illuminates red during a fault alarm
2	Display
3	Auto LED • The LED illuminates green during automatic operation • The LED flashes green during manual operation • The LED is not illuminated when the system is stopped
4	Stop • For commissioning and entry of new values in the controller
5	OK • Confirm actions
6	Manual • For tests and maintenance tasks

7	"Back" to the previous menu
8	Auto • For continuous operation
9	"Forward" to the next menu
10	Menu • Call up the Customer menu
11	Quit • Acknowledge messages

Selecting and changing parameters

- Use "OK" (5) to select the parameter.
- Use the arrow buttons (7) or (9) to change the parameter value.
- Use "OK" (5) to confirm the parameter.
- Use the arrow buttons (7) or (9) to change the menu option.
- Use "Quit" (11) to switch to different menu level.

7.4 Modifying the controller's start routine



Danger – Electric shock!

- Serious injury or death due to electric shock.
 - Any system in which the device is to be installed must be de-energised.
 - Ensure that the system is locked and cannot be switched on by other personnel.
 - Installation work for the electric connection of the device must be carried out by an authorised electrician in compliance with electrical engineering regulations.

The start routine is used to set the required parameters for the device commissioning. It commences with the first activation of the controller and can be run only once. Parameters can be changed or checked in the customer menu after the start routine has terminated see chapter 8.2.1 "Customer menu" on page 50 .



Notice!

Plug in the contact plug to provide power (230 V) to the controller.

You are now in Stop mode. The "Auto" LED on the operator panel has extinguished.

Device name	Variomat
Standard software with various languages.	Language
Prior to commissioning, read the entire operating manual and verify the proper assembly.	Read the operating manual!
Enter the value for the minimum operating pressure. <ul style="list-style-type: none"> • Calculating the minimum operating pressure, see chapter 7.2 "Determine the P0 minimum operating pressure for the controller" on page 35 . 	Min. op. pressure
Change the flashing display items for "Hour", "Minute", and "Seconds" to the current time. <ul style="list-style-type: none"> • The time of an alarm will be stored in the fault memory. 	Time
Change the flashing display items for "Day", "Month", and "Year" to the current date. <ul style="list-style-type: none"> • The date of an alarm will be stored in the fault memory. 	Date
Select the size of the "VG" primary tank. <ul style="list-style-type: none"> • For the primary tank data, see the name plate or see chapter 5 "Technical data" on page 14 . 	00500 l 740 mm GB = 0093 kg

Null balancing of the level sensor.

- The controller checks whether the level measuring signal matches the dimensional data of the "VG" primary tank. The primary tank must be fully emptied, see `dg_ref_source_inline>Montage Niveaumessung</dg_ref_source_inline>`.

1 %	1.7 bar
Null balancing!	

Upon successful conclusion of the null balancing, confirm with "OK" on the controller operator panel.

0 %	1.0 bar
Null balancing concluded successfully	

Select "Yes" or "No" on the controller display and confirm with "OK" on the controller operator panel.

Cancel null balancing?	
	No

yes: The "VG" primary tank is fully emptied and the device is installed as per the instructions.

- If null balancing is still not possible, confirm with "Yes".. The start routine is terminated. Use the customer menu to repeat the null balancing, see chapter 6.3.6 "Fitting the level sensor" on page 25 .
- Contact your Reflex Customer Service, see chapter 8.2.1 "Customer menu" on page 50 .

no: The start routine restarts.

- Check the prerequisites for the commissioning, see chapter 8.2.1 "Customer menu" on page 50 .

This message appears on the display only after null balancing has been successful. Select "Yes" or "No" on the controller display and confirm with "OK" on the controller operator panel.

Terminate routine?	
	No

yes: The start routine is terminated, the device automatically switches to Stop mode.

no: The start routine restarts.

The level indication is at 0 %.

0 %	2.0 bar
STOP	



Notice!

After successful conclusion of the start routine, you are in Stop mode. Do not yet switch to Automatic mode.

see chapter 7.1 "Checking the requirements for commissioning" on page 34

7.5 Filling the tanks with water

The following information applies to the devices:

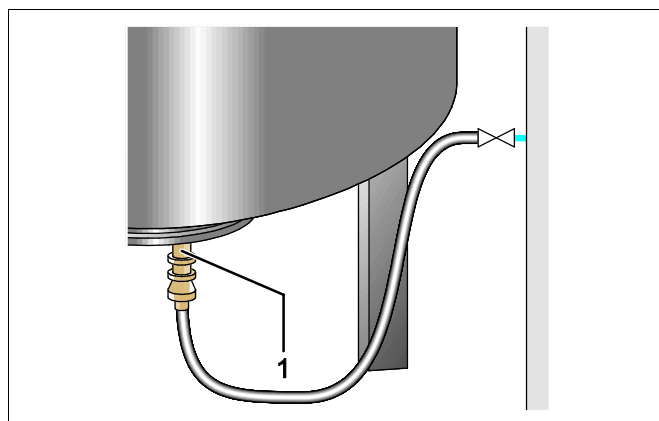
- Control unit and "VG" primary tank.
- Control unit and "VG" primary tank and one "VF" secondary tank.
- Control unit and "VG" primary tank and multiple "VF" secondary tanks.

Facility system	System temperature	Filling level of "VG" primary tank
Heating system	$\geq 50\text{ }^{\circ}\text{C}$	Approx. 30 %
Cooling system	$< 50\text{ }^{\circ}\text{C}$	Approx. 50 %

7.5.1 Filling with a hose

Preferably use a water hose to fill the "VG" primary tank with water when the automatic make-up device is not yet connected.

- Use a vented water hose filled with water.
- Connect the water hose to the external water supply and the "FD" feed and drain cock (1) at the "VG" primary tank.
- Check whether the shut-off valves between control unit and primary tank are open (supplied pre-wired in open position).
- Fill the primary tank with water until the filling level has been reached.



7.5.2 Filling with the make-up solenoid valve

Switch from Stop mode to Manual mode and open the solenoid valve of the make-up device until the filling level has been reached.

- Press "Manual" on the controller's operator panel.
- Select the "WV1" make-up solenoid valve.
- Confirm your selection with "OK" on the controller operator panel.



Notice!

For a detailed description of the Manual mode and the selection of the make-up solenoid valve, see chapter 8.1.2 "Manual mode" on page 48.

7.6 Venting the pump

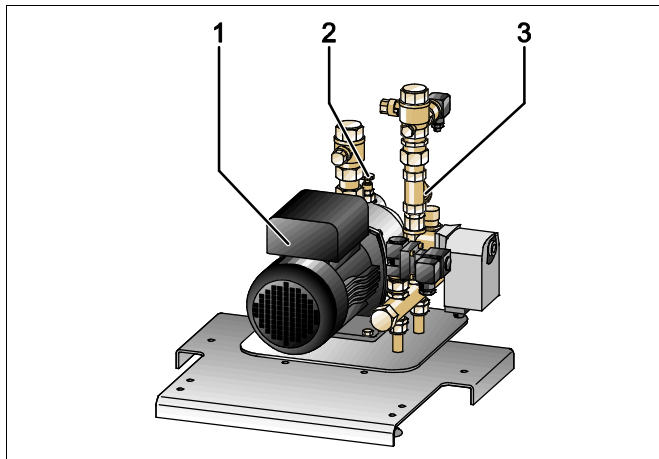


Caution – risk of burning!

- Risk of burning from escaping medium
 - Maintain sufficient distance from the escaping medium.
 - Wear suitable personal protective equipment (safety gloves and goggles, for example).

Vent the "PU" pump as follows:

- Remove the vent screw (2) from the pump (1) and vent the pump until bubble-free water escapes.
- Screw the vent screw (2) back in and tighten.
- Check the vent screw (2) for leaks.



1	"PU" pump
2	"AV" vent screw
3	"ST" dirt trap



Notice!

Repeat the venting process if the pump does not deliver.

7.7 Parametrising the controller in the Customer menu

Use the Customer menu to display or correct system-specific values. In the course of commissioning, the factory settings must be adjusted for the system-specific conditions.



Notice!

Operation description, see chapter 7.3.1 "Operator panel" on page 36 .

All grey marked menu items must be reviewed during commissioning.

Press "Manual" to switch to manual operation.

Press "Menu" to display the first main menu option "Customer menu".

Switch to the next main menu option.

Customer menu

Standard software with various languages.

Language

Adjust the "Hour", "Minute", and "Second" display when each begins to flash.
This time is used for entries in the fault memory.

Time:

Adjust the "Day", "Month", and "Year" display when each begins to flash.
This date is used for entries in the fault memory.

Date:

The controller checks whether the level sensor signal matches the value entered for the "VG" primary tank in the controller, see chapter 7.4 "Modifying the controller's start routine" on page 37 .

1 % 1.7 bar
Null balancing concluded
successfully!



Notice!

The "VG" primary tank must be completely empty.

One of the following messages appears on the display:

- Null balancing concluded successfully

Confirm with the "▼" button.

- Empty the tank and repeat the process

Confirm with "OK".

0 % 0 bar
XXX XXX XXX XXX

This message appears when null balancing has failed. Select "Yes" or "No" on the display.

Yes: The "VG" primary tank is empty and the device is installed as per the instructions. If null balancing is still not possible, cancel with "Yes".. Contact your Reflex Customer Service.

No: Check the prerequisites for the commissioning, see chapter 7.1 "Checking the requirements for commissioning" on page 34 .

Confirm the selection of "Yes" or "No" with "OK".

0 % 0 bar
Cancel null balancing
No

Enter the value for the minimum operating pressure.



Notice!

Calculation of minimum operating pressure, see chapter 7.2 "Determine the P0 minimum operating pressure for the controller" on page 35 .

Min.op.pressure

01.8 bar

Switch to the "Degassing" sub-menu.

- Press "OK" to open the menu.
- Use the "▼▲" buttons to open the next sub-menu.

Degassing>

Switch to the next list item.

Select between the degassing programmes:

- Continuous degassing
- Interval degassing

For a detailed description, see chapter 8.1.1 "Automatic mode" on page 47 .

Time setting for Continuous degassing.

The standard values during commissioning can be between 12 and 100 hours. The default setting is 12 hours.

Less times for continuous degassing are sufficient when the following conditions apply:

- Significant gauge pressure (≥ 0.5 bar above atmospheric pressure) at the high point.
- Little difference between the maximum temperature at the high point and the degassing temperature.
- Small system volume with low initial gas content due to good initial ventilation, for example.

Switch to the "Make-up" sub-menu.

- Press "OK" to open the menu.
- Use the "▼▲" buttons to open the sub-menu.

Make-up

If the water content is below the specified tank size, add water, see chapter 7.4 "Modifying the controller's start routine" on page 37 .

- If an automatic make-up device (Fillcontrol for example) is installed, make-up will be actuated automatically; otherwise the make-up must be manually activated.

Terminate the water make-up when the specified tank size is exceeded.

- If an automatic make-up device is installed, make-up will be shut off automatically; otherwise the make-up must be manually deactivated.
- If you have selected "No" for automatic make-up, the system will not return any further queries about the make-up.

Pre-selected time for a make-up cycle. Upon expiry of this set time, the system interrupts the make-up and returns the "Make-up time" fault message.

Max. make-up time
010 min.

If the set number of make-up cycles is exceeded within two hours, the system interrupts the make-up and returns the "Make-up cycles" fault message.

Max. make-up cycl.
003 / 2 h

yes: FQIRA+ contact water meter is installed, see chapter 4.6 "Optional equipment and accessories" on page 13 .
This is the prerequisite for the make-up quantity monitoring and the operation of a softening system.

With water meter
YES

no: A contact water meter is not installed (standard model).

Only displayed if "YES" has been set in the "With water meter" menu option.

- Use "OK" to delete the counter.
 - Press "YES" to reset the value displayed to "0".
 - Press "No" to retain the displayed value.

Make-up quantity
000020 l

This value is only displayed if "YES" has been set in the "With water meter" menu option.

- When the set quantity is exceeded, the system interrupts the make-up process and returns the error message "Max. make-up quantity exceeded".

Max. make-up qty.
000100 l

This value is only displayed if "YES" has been set in the "With water meter" menu option.

With softening
YES

yes: The system offers more queries regarding the softening process.

no: The system does not offer more queries regarding the softening process.

This value is only displayed if "YES" has been set in the "With softening" menu option.

Lock make-up?
YES

yes: The system stops the make-up process when the set soft water capacity is exceeded.

no: The system does not stop the make-up process. The system displays the "Softening" message.

This value is only displayed if "YES" has been set in the "With softening" menu option.

- Hardness reduction is calculated from the difference of the overall water hardness GH_{actual} and the target water hardness GH_{target} .
 - $Hardness\ reduction = GH_{actual} - GH_{target} \text{ l } ^\circ dH$

Hardness reduction
10 °dH

Enter the value in the controller. Consult the manufacturer information for third-party products.

This value is only displayed if "YES" has been set in the "With softening" menu option.
The attainable soft water capacity is calculated from the type of softening used and the specified hardness reduction.

- Fillsoft I, soft water capacity $\leq 6000/\text{hardness red. I}$
- Fillsoft II, soft water capacity $\leq 12000/\text{hardness red. I}$

Enter the value in the controller. Consult the manufacturer information for the values of third-party products.

Cap. soft water
05000 l

This value is only displayed if "YES" has been set in the "With softening" menu option.

- Available soft water capacity.

Remaining cap. soft w.
000020 l

This value is only displayed if "YES" has been set in the "With softening" menu option.

- Manufacturer specification for the replacement interval of the softening cartridges, regardless of the calculated soft water capacity. The system displays the "Softening" message.

Replacement
18 months

Recommended maintenance messages.

Off: Without maintenance recommendation.

001 – 060: Maintenance recommendation in months.

Next maintenance
012 months

For the output of messages to the floating contact, see chapter 8.2.4 "Messages" on page 53.

yes: Output of all messages.

no: Output of all messages identified with "xxx" ("01", for example).

Floating fault contact
YES

Switch to the "Fault memory" sub-menu.

- Press "OK" to open the menu.
- Use the "▼ ▲" buttons to open the sub-menu.

Fault memory>

The last 20 alarms are stored with fault type, date, time, and fault code.

See the chapter "Messages" for more information about the ER... messages.

ER 01...xx

Switch to the "Parameter memory" sub-menu.

- Press "OK" to open the menu.
- Use the "▼▲" buttons to open the sub-menu.

Parameter memory>

The last 10 entries of the minimum working pressure are stored with date and time.

P0 = xx.x bar
Date | Time

The system displays the values for the volume and the diameter of the "VG" primary tank.

- If you identify differences to the information provided on the primary tank's nameplate, please contact the Reflex Customer Service.

Tank info
00800 l

This value displays in percent the opening angle of the motor ball valve of the overflow line.

Pos. motor ball valve
000 %

Information about the software version

Variomat
mkh V1.00

7.8 Starting Automatic mode

The Automatic mode can be started as soon as the system is filled with water and the gases contained have been vented.

- At the controller, press "Auto" for automatic operation.
 - During commissioning, continuous degassing is automatically activated to remove any residual free or dissolved gases from the system. This time can be set in the Customer menu as required by the system conditions. The default setting is 12 hours. Subsequent to the continuous degassing, the device automatically switches to interval degassing.



Notice!

The commissioning process is now concluded.



Notice!

The "ST" dirt trap in the "DC" degassing line must be cleaned after the expiry of the continuous degassing time at the latest, see chapter 9.2.1 "Cleaning the dirt trap" on page 58 .

8 Operation

8.1 Operating modes

8.1.1 Automatic mode

After successful commissioning, start the Automatic mode from the device. The Automatic mode is suitable for continuous device operation and the controller monitors the following functions:

- Maintain pressure
- Compensate expansion volume
- Degas
- Automatic make-up

Press "Auto" on the controller operator panel to start the Automatic mode. The "PU" pump and the "PV1" motor ball valve of the overflow line are regulated by the controller so that the pressure remains constant at a regulation range of ± 0.2 bar. Faults are displayed and evaluated. The "PV1" motor ball valve of the overflow line remains open during the adjustable degassing time as long as the pump runs. In the de-pressurised "VG" primary tank, the system water is expanded and degassed. For Automatic mode, you can set various degassing programmes in the Customer menu, see chapter 8.2.1 "Customer menu" on page 50. The controller display supplies the necessary information.

Continuous degassing

Select this programme after commissioning and repairs of the connected system.

- The device will continuously degas for a set period of time. Free and dissolved gases are quickly removed.

Start/setting:

- Automatic start after execution of the start routine during commissioning.
- Activated from the Customer menu.
- The degassing time can be set in the Customer menu, dependent on the actual system.
 - The default setting is 12 hours. After expiry of the set time, the device automatically switches to interval degassing.

30 %	2.5 bar
Continuous degassing	

Interval degassing

Select this programme for continuous operation. As the default setting, it is set in the Customer menu see chapter 8.2.1 "Customer menu" on page 50.

Degassing is continuous during an interval. An idling time follows an interval. The interval degassing mode can be limited to an adjustable time period. Set the time in the Service menu, see chapter 8.2.2 "Service menu" on page 50, möglich.

Start/setting:

- Automatic activation upon expiry of continuous degassing.
- Degassing interval
 - The default setting is 90 seconds.
- Idling time
 - The default setting is 120 minutes
- Start/End
 - 8:00 to 18:00 o'clock.

30 %	2.5 bar
Interval degassing	

8.1.2 Manual mode

The Manual mode is intended for test and service tasks.

Press "Manual" on the controller. The Auto LED at the operator panel flashes to visually indicate that Manual mode is active. Manual mode enables you to select the following functions and to perform a test run:

- "PU" pump.
- "PV" motor ball valve in the "PV" overflow line.
- "WV" make-up solenoid valve.

You can switch several functions after each other and test them at the same time.

- Use the "Switch up/down" keys to select the function.
 - "PU1" = Pump
 - "PV1" = Solenoid valve in the overflow line
 - "WV1" = Make-up solenoid valve
- Press "OK".
 - Confirm the selection or shut-down of the individual functions.
- "Quit" button
 - Shut-down of the individual functions in reverse order.
 - Press "Quit" for the last time and the system moves in Stop mode.
- "Auto" button
 - Return to Automatic mode.

30%		2.5 bar
PU1!*	PV1	WV1

* Units with "!" are selected and active.



Notice!

Manual operation can not be performed if safety-relevant parameters are exceeded.

- Switching is blocked if safety-relevant parameters are exceeded.

8.1.3 Stop mode

The Stop mode is intended for the device commissioning.

Press "Stop" on the controller. The Auto LED at the operator panel extinguishes.

Except for the display of information, the device is non-functional in Stop mode. Function monitoring is stopped.

The following functions are deactivated:

- The "PU" pump is switched off.
- The "PV" motor ball valve in the "PV" overflow line is closed.
- The "WV" solenoid valve in the make-up line is closed.



Notice!

The system returns an alarm if the Stop mode is activated for more than 4 hours.

- If "Floating alarm contact?" in the Customer menu is set to "Yes", the system outputs the alarm to the group alarm contact.

8.1.4 Summer operation

The degassing of the network water is not assured if the circulating pumps of the system are shut down during Summer because gas-rich water cannot reach the device. In this event, use the Customer menu to shut-down interval degassing to save energy. After Summer, select the "Interval degassing" degassing programme in the Customer menu or "Continuous degassing", if required.

Setting in the Customer menu, see chapter 8.2.1 "Customer menu" on page 50 .

Select from the available degassing programmes:

- Continuous degassing
 - For commissioning and after repairs.
- Interval degassing
 - For continuous operation (time-controlled).

Degassing programme Run-on degassing



Notice!

For a detailed description of the selection of degassing programmes, see chapter 8.1.1 "Automatic mode" on page 47 .



Notice!

The pressure maintaining feature of the device must remain operative in Summer.

8.1.5 Restarting



Caution – Risk of injury due to pump start!

- Injuries to your hand and damage to property at the pump due to a pump start.
 - De-energise the pump prior to turning the pump at the fan wheel with a screwdriver.

After an extended standstill time (the device is de-energised or in Stop mode), the "PU" pump may jam. For this reason, use a screwdriver to rotate the pump at the fan wheel of the pump motor before restarting.



Notice!

A jamming of the "PU" pump is prevented during operation thanks to forced starting action (after 24 hours).

8.2 Controller

8.2.1 Customer menu

Use the Customer menu to set the device controller during commissioning. You can then correct or retrieve system-specific values during operation, see chapter 7.7 "Parametrising the controller in the Customer menu" on page 41 .

8.2.2 Service menu

This menu is protected with a password. It can be accessed only by the Reflex Customer Service. A partial summary of the settings stored in the Service menu is provided in the Chapter Default settings.

8.2.3 Default settings

The device controller is shipped with the following default settings. Use the Customer menu to adjust these values to local conditions. In specific cases, it is possible to further adjust the values in the Service menu.

Customer menu

Parameter	Setting	Remarks
Language	EN	Display language.
Minimum operating pressure "P0"	1.8 bar	see chapter 7.2 "Determine the P0 minimum operating pressure for the controller" on page 35 .
Next maintenance	12 months	Time left to the next due maintenance
Floating alarm contact	YES	see chapter 8.2.4 "Messages" on page 53 .
Make-up		
Maximum make-up quantity	0 Litres	Only when "With water meter Yes" has been selected in the Customer menu under Make-up.
Maximum make-up time	20 minutes	
Maximum make-up cycles	3 cycles within 2 hours	
Degassing		
Degassing programme	Continuous degassing	
Continuous degassing time	12 hours	Default setting
Softening (Only if "With softening Yes")		
Lock make-up	No	In the case of soft water residual capacity = 0
Hardness reduction	8°dH	= Target – Actual
Maximum make-up quantity	0 Litres	
Soft water capacity	0 Litres	
Cartridge replacement	18 months	Replace cartridge.

Service menu

Parameter	Setting	Remarks
Maintain pressure		
Pump "ON"	P0 + 0.3 bar	Differential pressured added to the "P0" minimum operating pressure.
Pump "OFF"	P0 + 0.5 bar	Differential pressured added to the "P0" minimum operating pressure.
Forced pump start	24 h	If the pump is standing still for 24 hours, it is forced to run for 3 seconds.
"Pump run time exceeded" message	30 minutes	The message is displayed after the pump runs for 30 minutes.
Overflow line "CLOSED"	P0 + 0.5 bar	Differential pressured added to the "P0" minimum operating pressure.
Overflow line "OPEN"	P0 + 0.7 bar	Differential pressured added to the "P0" minimum operating pressure.
Maximum pressure	P0 + 3 bar	Differential pressured added to the "P0" minimum operating pressure.
Degassing		
Degassing time of interval degassing mode	90 seconds	
Idling time of interval degassing mode	120 minutes	
Interval degassing start	08:00 h	
Interval degassing end	18:00 h	
Filling levels		
Insufficient water "ON"	6 %	The "PU" pump is activated at a minimum filling level of 6 % in the "VG" primary tank.
Insufficient water "OFF"	12 %	The "PU" pump is deactivated at a filling level of 12 % in the "VG" primary tank.
Solenoid valve in overflow line "CLOSED"	90 %	

8.2.4 Messages

The display provides alarms in plain text and the ER codes shown in the list. Use the arrow buttons to scroll through multiple alarms displayed at the same time.

The fault memory stores the last 20 alarms for review, see chapter 7.7 "Parametrising the controller in the Customer menu" on page 41 .

Alarm causes can be eliminated by the operator or a specialist workshop. If this is not possible, contact the Reflex Customer Service.



Notice!

When the cause for the alarm is eliminated, you must acknowledge the fault with "Quit" at the controller's operator panel. All other alarms are automatically reset as soon as the cause has been eliminated.



Notice!

Floating contacts, setting in the Customer menu, see chapter 7.7 "Parametrising the controller in the Customer menu" on page 41 .

ER Code	Alarm	Floating contact	Causes	Remedy	Alarm reset
01	Minimum pressure	YES	<ul style="list-style-type: none"> Set value not reached. Water loss in the system. Pump fault. Controller in Manual mode 	<ul style="list-style-type: none"> Check set value in the Customer or Service menu. Check water level. Check pump. Set the controller to Automatic mode. 	"Quit"
02.1	Insufficient water	-	<ul style="list-style-type: none"> Set value not reached. Make-up disabled. Air in the system. Dirt trap clogged. 	<ul style="list-style-type: none"> Check set value in the Customer or Service menu. Clean the dirt trap. Check functioning of the "PV1" solenoid valve. If necessary, manually add water. 	-
03	High water	YES	<ul style="list-style-type: none"> Set value exceeded. Make-up disabled. Water intake through a leak in a thermal transfer medium of the user. "VG" and "VF" tanks too small. 	<ul style="list-style-type: none"> Check set value in the Customer or Service menu. Check functioning of the "WV1" solenoid valve. Drain water from the "VG" tank. Check user's thermal transfer medium for leaks. 	-
04.1	Pump	YES	Pump disabled. <ul style="list-style-type: none"> Pump jammed. Pump motor defective. Pump motor contactor (Klixon) tripped. Fuse defective. 	<ul style="list-style-type: none"> Rotate the pump with screwdriver. Replace the pump motor. Electrically test the pump motor. Replace the fuse. 	"Quit"

ER Code	Alarm	Floating contact	Causes	Remedy	Alarm reset
05	Pump run time	-	<ul style="list-style-type: none"> Set value exceeded. Severe water loss in the system. Cap valve at the intake side closed. Air in the pump. Solenoid valve in the overflow line does not close. 	<ul style="list-style-type: none"> Check set value in the Customer or Service menu. Check the water loss and correct, if necessary. Open the cap valve. Vent the pump. Check functioning of the "PV1" solenoid valve. 	-
06	Make-up time	-	<ul style="list-style-type: none"> Set value exceeded. Water loss in the system. Make-up line not connected. Make-up rate insufficient. Make-up hysteresis too low. 	<ul style="list-style-type: none"> Check set value in the Customer or Service menu. Check water level. Connect make-up line 	"Quit"
07	Make-up cycles	-	Set value exceeded.	<ul style="list-style-type: none"> Check set value in the Customer or Service menu. Seal any leak in the system. 	"Quit"
08	Pressure measurement	YES	Controller receives incorrect signal.	<ul style="list-style-type: none"> Connect the plug. Check functioning of the pressure sensor. Check the cable for damage. Check the pressure transducer. 	"Quit"
09	Level sensor	YES	Controller receives incorrect signal.	<ul style="list-style-type: none"> Check functioning of the oil pick-up sensor. Check the cable for damage. Connect the plug. 	"Quit"
10	Maximum pressure	-	<ul style="list-style-type: none"> Set value exceeded. Overflow line disabled. Dirt trap clogged. 	<ul style="list-style-type: none"> Check set value in the Customer or Service menu. Check functioning of the overflow line. Clean the dirt trap. 	"Quit"
11	Make-up quantity	-	<p>"With water meter" must be activated in the Customer menu.</p> <ul style="list-style-type: none"> Set value exceeded. Severe water loss in the system. 	<ul style="list-style-type: none"> Check set value in the Customer or Service menu. Check water loss in the system and repair, if necessary. 	"Quit"

ER Code	Alarm	Floating contact	Causes	Remedy	Alarm reset
15	Make-up valve	-	Contact water meter measures without make-up request.	Check the make-up valve for leaks.	"Quit"
16	Power failure	-	No power.	Connect to power supply.	-
19	Stop > 4 hours	-	Device is in Stop mode for more than 4 hours.	Set the controller to Automatic mode.	-
20	Max. Make-up volume	-	Set value exceeded.	Reset the "Make-up quantity" meter in the Customer menu.	"Quit"
21	Maintenance recommended	-	Set value exceeded.	Perform maintenance and reset the maintenance counter upon completion.	"Quit"
24	Softening	-	<ul style="list-style-type: none"> Set value for soft water capacity exceeded. Time interval for replacement of the softening cartridge exceeded. 	Replace the softening cartridges.	"Quit"
30	I/O module fault	-	<ul style="list-style-type: none"> I/O module defective. Connection between option card and controller faulty. Option card defective. 	Contact the Reflex Customer Service.	-
31	EEPROM defective	YES	<ul style="list-style-type: none"> EEPROM defective. Internal calculation error. 	Contact Reflex Customer Service.	"Quit"
32	Undervoltage	YES	Supply voltage not achieved.	Check power supply.	-
33	Adjustment parameters faulty	YES	EEPROM parameter memory defective.	Contact the Reflex Customer Service.	-
34	Communication Main board faulty	-	<ul style="list-style-type: none"> Connecting cable defective. Main board defective. 	Contact the Reflex Customer Service.	-
35	Digital input voltage faulty	-	Short-circuit of input voltage.	Check the wiring at the digital inputs (water meter, for example).	-
36	Analogue input voltage faulty	-	Short-circuit of input voltage.	Check the wiring at the analogue inputs (pressure/level).	-
37	Input voltage Ball valve missing	-	Short-circuit of input voltage.	Check wiring of the ball valve.	-

9 Maintenance



Caution – risk of burning!

- Risk of burning from escaping medium
 - Maintain sufficient distance from the escaping medium.
 - Wear suitable personal protective equipment (safety gloves and goggles, for example).



Danger – Electric shock!

- Serious injury or death due to electric shock.
 - Any system in which the device is to be installed must be de-energised.
 - Ensure that the system is locked and cannot be switched on by other personnel.
 - Installation work for the electric connection of the device must be carried out by an authorised electrician in compliance with electrical engineering regulations.

The device is to be maintained annually.

- The maintenance intervals depend on the operating conditions and the degassing times.

The annual maintenance is displayed upon expiry of the set operating time. Use "Quit" to acknowledge the "Maintenance recommended" message. Reset the maintenance counter in the Customer menu.



Notice!

Maintenance work must be carried out and confirmed by specialist personnel or the Reflex Customer Service, see chapter 9.4 "Maintenance certificate " on page 61 .

9.1 Maintenance schedule

The maintenance schedule is a summary of maintenance tasks to be carried out regularly.

Maintenance task	Conditions			Interval
▲ = Check, ■ = Service, ● = Clean				
Check for leaks. • "PU" pump. • Screw connections. • Check valve downstream of "PU" pump.	▲	■		Annually
Clean "ST" dirt trap. – see chapter 9.2.1 "Cleaning the dirt trap" on page 58 .	▲	■	●	Depending on the operating conditions
Clear sludge from "VG" primary tank and "VF" secondary tanks. – see chapter 9.2.2 "Cleaning the tanks" on page 59 .	▲	■	●	Depending on the operating conditions
Check the make-up switching points. – see chapter 9.3 "Checking switching points" on page 60 .	▲			Annually
Check the Automatic mode switching points. – see chapter 9.3 "Checking switching points" on page 60 .	▲			Annually

9.2 Cleaning

9.2.1 Cleaning the dirt trap

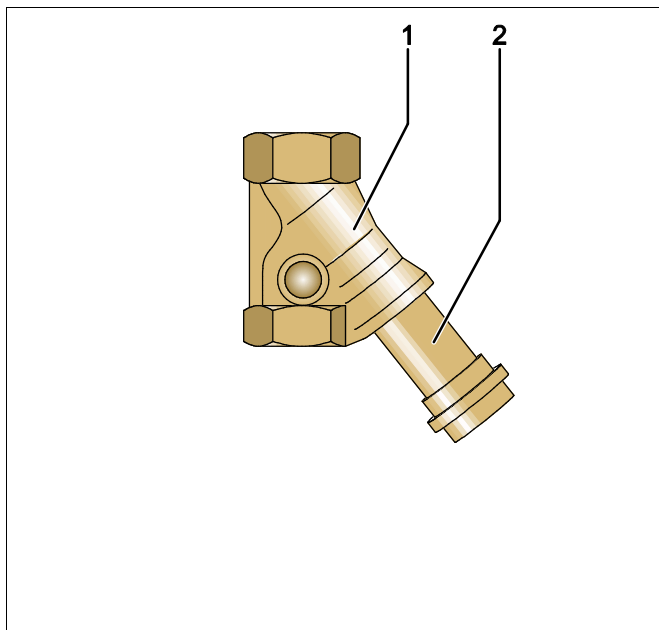


Caution – risk of injury!

- Incorrect installation or service work may cause burns and other injuries at the connections when hot water or steam suddenly escape at pressure.
 - Ensure proper installation.
 - Ensure that the system is de-pressurised before performing service work at the connections.

The "ST" dirt trap must be cleaned after the expiry of the continuous degassing time at the latest. An inspection is also required after longer lasting operation.

- Switch to Stop mode.
 - Press "Stop" on the controller's operator panel.
- Close the ball valves upstream of the "ST" dirt trap (1) and the "VG" primary tank.
- Slowly unscrew the dirt trap insert (2) from the dirt trap in order for the residual pressure to escape from the pipeline segment.
- Pull the mesh from the dirt trap insert and rinse it with clear water. Use a soft brush for cleaning.
- Re-insert the mesh into the dirt trap insert, check the gasket for damage, and screw the dirt trap insert back into the housing of the "ST" (1) dirt trap.
- Open the ball valves upstream of the "ST" dirt trap (1) and the "VG" primary tank.
- Vent the "PU" pump, see chapter 7.6 "Venting the pump" on page 40 .
- Switch to Automatic mode.
 - Press "Auto" on the controller's operator panel.



1	"ST" dirt trap	2	Dirt trap insert
---	----------------	---	------------------



Notice!

Clean all other installed dirt traps (in the Fillset, for example).

9.2.2 Cleaning the tanks



Caution – risk of injury!

- Incorrect installation or service work may cause burns and other injuries at the connections when hot water or steam suddenly escape at pressure.
 - Ensure proper installation.
 - Ensure that the system is de-pressurised before performing service work at the connections.

Clean the "VG" primary tank and any "VF" secondary from sludge deposits.

- Switch to Stop mode.
 - Press "Stop" on the controller's operator panel.
- Drain the "VG" and "VF" tanks.
 - Open the "FD" feed and drain cocks and empty the tanks completely from water.
- Remove the hose connection between the "VG" primary tank and the "VF" secondary tank, if provided.
- Remove the lower vessel covers from the "VG" and "VF" tanks.
- Remove any sludge from the covers and the spaces between the diaphragms and the tanks.
- Reinstall the covers on the "VG" and "VF" tanks.
- Reinstall the hose connection between the "VG" primary tank and the "VF" secondary tank, if provided.
- Close the "FD" feed and drain cocks at the "VG" and "VF" tanks.
- Use the "FD" feed and drain cock to fill the "VG" tank with water, see chapter 7.5 "Filling the tanks with water" on page 39 .
- Switch to Automatic mode.
 - Press "Auto" on the controller's operator panel.

9.3 Checking switching points

Check the functioning of the following switching points.

Check the make-up switching points:

- Set the device to Automatic mode.
 - Press "Auto" on the controller's operator panel.
- Use the automatic make-up to fill the "VG" primary tank.
 - Check the switching points for insufficient water, "Make-up ON"/"Make-up OFF", see chapter 7.7 "Parametrising the controller in the Customer menu" on page 41 .
 - If necessary, use the "FD" feed and cock valve to manually raise the filling level to the previously noted value.

You can also check the switching point using the load and unload indication of the level sensor (oil pick-up).

Check the switching points of the controller's Automatic mode.

- Set the device to Manual mode.
 - Press "Manual" on the controller's operator panel.
- Manually run the "PU" pump beyond the actuating pressure of the "PV" overflow solenoid valve, see chapter 8.1.2 "Manual mode" on page 48 .
- Set the device to Automatic mode.
 - Press "Auto" on the controller's operator panel.

The overflow valve must open and close at the value set in the Customer menu.

- Set the device back to Manual mode.
 - Press "Manual" on the controller's operator panel.
- Allow the "PV" overflow solenoid valve to run below the actuating pressure of the "PU" pump, see chapter 8.1.2 "Manual mode" on page 48 .
- Set the device to Automatic mode.
 - Press "Auto" on the controller's operator panel.

The "PU" pump must start and shut down at the value set in the Customer menu.

9.4 Maintenance certificate

All maintenance tasks have been completed according to the Reflex Installation, Operating and Maintenance Manual.

[illegible]

9.5 Inspection

9.5.1 Pressure-bearing components

Comply with all applicable national regulations for the operation of pressure equipment. De-pressurise all pressurised components prior to inspection (see disassembly information).

9.5.2 Inspection prior to commissioning

In Germany, follow the Industrial Safety Regulation [Betriebssicherheitsverordnung] Section 14 and Section 14 (3) No. 6 in particular.

9.5.3 Inspection intervals

Recommended maximum inspection intervals for operation in Germany pursuant to Section 15 of the Industrial Safety Regulation [Betriebssicherheitsverordnung] and the vessel classification of the device in diagram 2 of the EU Directive 97/23/EC, applicable in strict compliance with the Reflex Installation, Operation and Maintenance Manual.

External inspection:

No requirement according to Section 15 (6).

Internal inspection:

Maximum interval according to Section § 15 (5); if necessary, suitable replacement actions are to be taken (such as wall thickness measurement and comparison with the design specification which may be requested from the manufacturer)..

Tightness test:

Maximum interval according to Section 15 (5), possibly in conjunction with Section 15 (10).

Furthermore, compliance with Section 15 of the Industrial Safety Regulation and Section 15 (1) in particular, in conjunction with Section 14 (3) No. 6 and Section 15 (6), must be ensured.

The actual intervals must be determined by the user on the basis of a safety-technical assessment taking into account the real operational conditions, the experience with the operation and the charging material, and the national regulations for the operation of pressure equipment.

10 Disassembly



Danger – Electric shock!

- Serious injury or death due to electric shock.
 - Any system in which the device is to be installed must be de-energised.
 - Ensure that the system is locked and cannot be switched on by other personnel.
 - Installation work for the electric connection of the device must be carried out by an authorised electrician in compliance with electrical engineering regulations.



Danger – Electric shock!

- Serious injury or death due to electric shock. Some parts of the main board may still carry 230V voltage even with the device physically isolated from the 230 V power supply.
 - Before you remove the covers, completely isolate the device controller from the power supply.



Caution – risk of burning!

- Risk of burning from escaping medium
 - Maintain sufficient distance from the escaping medium.
 - Wear suitable personal protective equipment (safety gloves and goggles, for example).



Caution – risk of burning!

- Excessive surface temperatures in heating systems can cause skin to burn.
 - Wait until surfaces have cooled down or wear protective gloves.
 - The operator is required to attach corresponding warning notes in the device vicinity.



Caution – risk of injury!

- Incorrect installation or service work may cause burns and other injuries at the connections when hot water or steam suddenly escape at pressure.
 - Ensure proper disassembly.
 - Ensure that the system is de-pressurised before performing the disassembly.

Prior to disassembly, disconnect all water-sided connections from the device. Vent the device to de-pressurise it. Then disconnect the device from electrical voltages.

- Disconnect the system from the power supply and secure it against unintended reactivation.
- Disconnect the power cable of the device from the power supply.
- Disconnect and remove all cables from the terminals of the device controller.
- Disconnect the "VF" secondary tank (if provided) on the water side from the system and the "VG" primary tank.
- Open the "FD" feed and drain cocks at the "VG" and "VF" tanks until they are completely empty and de-pressurised..
- Undo all hose and pipe connections to the "VG" and "VF" tanks and the control unit of the device to the system and remove them completely.
- If necessary, remove the "VG" and "VF" tanks and the device itself from the area.

11 Annex

11.1 Reflex Customer Service

Central customer service

Switchboard: Telephone number: +49 (0)2382 7069 - 0

Customer Service extension: +49 (0)2382 7069 - 9505

Fax: +49 (0)2382 7069 - 523

E-mail: service@reflex.de

11.2 Conformity and standards

Declaration of conformity for electrical installations in the pressure maintaining, make-up or degassing systems	
1.	<p>We hereby confirm that the products meet the essential protection requirements as established in the Council Directive to approximate the laws of the Member States relating to electromagnetic compatibility (2004/108/EC).</p> <p>The following Standards have been applied to assess the products:</p> <p>Deutsches Institut für Normung, European Standard 61326 – 1:2006-10</p>
2.	<p>We hereby confirm that the control cabinets meet the essential requirements of the Low-voltage Directive (2006/95/EC).</p> <p>The following Standards have been applied to assess the products:</p> <p>Deutsches Institut für Normung, European Standard 61010 – 1:2002-08, Occupational Health and Safety Regulations of the trade associations (German BGV, Para 2)</p>
Declaration of conformity for assemblies	
Design, manufacture, and testing of pressure equipment	
Applied assessment of conformity procedure according to the Pressure Equipment Directive 97/23/EU of the European Parliament and the Council of 29 May 1997	
Pressure expansion tanks and pressure-maintaining systems:	Device for universal application in heating, solar and cooling water systems
Type	according to vessel/assembly nameplate
Serial number	according to vessel/assembly nameplate
Year of manufacturing	according to vessel/assembly nameplate
Maximum allowable pressure	according to vessel/assembly nameplate
Test pressure	according to vessel nameplate
Minimum/maximum permissible temperature	according to vessel/assembly nameplate
Maximum continuous operation temperature for full and semi diaphragm	according to vessel/assembly nameplate
Charging material	Water, inert gas or air according to vessel nameplate
Standards and set of rules	Pressure Equipment Directive, prEN 13831:2000 or European Standard 13831:2007 or AD 2000 according to vessel nameplate
Pressure equipment	<p>Vessel, Article 3 Para. 1.1 a) 2. - (Annex II, Diagram 2) with:</p> <ul style="list-style-type: none"> Accessories, Article 3 Para. 1.4: Full diaphragm, vent pipe, equalising elbow and drain cock with flexible connection set <p>Assembly Article 3 Para. 2.2 comprising:</p> <ul style="list-style-type: none"> Vessel, Article 3 Para. 1.1 a) 2. - (Annex II, Diagram 2) with: Accessories, Article 3 Para. 1.4: Full diaphragm, vent pipe, equalising elbow and drain cock with flexible connection set Accessories, Article 3 Para. 1.4: Control unit with safety valve

Fluid group	2
Conformity assessment to module	B + D
Labelling according to Directive 97/23/EC	CE 0045
Safety valve (air side) (Category IV) See operating manual, item SV	Labelled and certified by the safety valve manufacturer pursuant to the provisions of the Directive 97/23/EC.
Certificate number of the EC Type Examination	For a vessel size of 200 to 1000 litres: 04 202 1 932 01 00051 For a vessel size of 1000 to 5000 litres: 04 202 1 450 02 00712
Certificate No., QA system (Module D)	07 202 1403 Z 0250/12/D0045
Notified body for the assessment of the QA system	TÜV Nord Systems GmbH & Co. KG Große Bahnstraße 31, D - 22525 Hamburg
Register No. of the notified body	0045
Manufacturer Reflex Winkelmann GmbH Gersteinstraße 19 D - 59227 Ahlen - Germany Telephone: +49 (0)2382 7069-0 Fax: +49 (0)2382 7069-588 E-mail: info@reflex.de	The manufacturer declares that the pressure equipment (the assembly) complies with the requirements of Directive 97/23/EC. Norbert Hülsmann / Volker Mael Members of the Board of Directors

11.3 Certificate No. of the design type examination

Type			Certificate number
Reflexomat Compact RC	200 – 500 litres	6 bar – 120 °C	04 202 1 450 04 01952
Reflexomat RS	200 – 800 litres	6 bar – 120 °C	04 202 1 932 01 00077
	1000 – 5000 litres	6 bar – 120 °C	04 202 1 450 02 00714
	350 – 5000 litres	10 bar – 120 °C	04 202 1 450 02 00039
	1000 – 5000 litres	10 bar – 120 °C	04 202 1 450 02 00715
Variomat	200 – 1000 litres	10 bar – 120 °C	04 202 1 932 01 00051
	1000 – 5000 litres	10 bar – 120 °C	04 202 1 450 02 00712
Gigamat	1000 – 5000 litres	10 bar – 120 °C	04 202 1 450 02 00713
	10000 Litres	10 bar – 120 °C	04 202 1 450 02 00062
Servitec	DN 150 - DN 250	10 bar/16 bar – 120 °C	04 202 1 450 03 00210

11.4 Guarantee

The respective statutory guarantee regulations apply.

11.5 Glossary

System	Heating, climate control or other building services system to which the device is connected.
Hysteresis	Delayed behaviour of an output variable relative to the input variable. (The input signal influences the output signal)
Cavitation	Formation and dissolution of vapour-filled cavities (vapour bubbles) in fluids.
Cumulated	Cumulation of values.
Klixon	Pressure safety cut-out for the protection of the pump motor.
Permeation	Process in which a substance (permeate) penetrates or migrates through a solid body.



Thinking solutions.

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